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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 6.] [1913.

XXXII.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW.—XIV.

(With Plate.)

Agaricaceae.

Laccaria nana, *Massee.* Figs. 17–20. *Pileus* carnosulus, ex hemispherico explanato-concavus, glaber, laevis, cinnamomeo-lividus, subexpallens, margine primitus albo-farinosa, 1 cm. latus. *Lamellae* subdistantes, postice attenuato-adnatae, pallidae, demum albo-pulverulentae. *Stipes* cavus, fibrillosus, albidus, 1 cm. longus. *Sporae* globosae, spinulosae, hyalinae, 15–16 μ. *Basidia* clavata, 2-sterigmatica, 30–35 × 7–8 μ.

Scattered on naked soil under trees. Distinguished from all known species by its small size, large spores and even, glabrous pileus. Q. *I. M.*

Omphalia kewense, *Massee.* Figs. 7–10. *Pileus* carnosulus, cylindraceo-campanulatus, glaberrimus, profunde sulcatus, margine crenatus, ochraceus dein albidus, 3–5 mm. altus. *Lamellae* distantes, membranaceae, subdecurrentes, acie integrae, pallidae. *Stipes* gracilis, teres, fistulosus, plus minus flexuosus, pallidus, 2–3 cm. longus. *Sporae* ellipsoideae, hyalinae, 7 × 5μ. *Basidia* subclavata, 28-32 × 6–7μ.

Gregarious on dead rhizomes in the Filmy fern house.

Remarkable for the deeply grooved, elongated, cylindric-campanulate pileus. Allied to *Omphalia picta*, Fries. *I. M.*

Lepiota gracilenta, *Krombh.*

Very unusual in the grounds. Somewhat smaller in size than *L. procera*, Scop., the "Parasol fungus," and also distinguished by the very fugacious ring. Q. *I. M.*

Mycena atroalba, *Bolton.*

This species is considered as one of the rarities of our flora, but is probably not uncommon, although confused with other black species of *Mycena*, from which it is distinguished by the distinctly swollen base of the stem, glaucous gills and dense mass of bristling, snow-white mycelium at the base of the stem. Q. *I. M.*

(30401—6a.) Wt. 212—780. 1125. 8/13. D & S.

Mycena adonis, *Bull.*
Perhaps our most beautiful *Mycena*. The cap is clear rose-colour and very translucent, remainder snow-white. Gregarious amongst grass. A. *I. M.*

Mycena amicta, *Fries.*
Gregarious, amongst grass under the drip of oak trees. A. *I. M.*

Mycena collariata, *Fries.*
Readily distinguished amongst the smaller species of *Mycena* having a greyish cap, by the gills being attached to a collar free from the stem as in *Marasmius rotula*, Fr. On fallen twigs. Q. *I. M.*

Collybia luteifolia, *Gillet.*
Readily distinguished from every other species of *Collybia* by the sulphur yellow gills and the reddish cap and stem. New to the British flora. On the ground. Q. *I. M.*

Leptonia solstitialis, *Fries.*
Among grass. A. *I. M.*

Galera ovalis, *Fries.*
A very beautiful fungus, cap rich chestnut-brown, becoming pale buff when dry.
In tufts on dung. A. *I. M.*

Naucoria abstrusa, *Fries.*
A small brown fungus, commonly confused with the very common *Naucoria melinoides*, which differs in having a striate, dry cap, whereas in *N abstrusa* the cap is even and viscid. Among grass. A. *I. M.*

Hebeloma versipelle, *Fries.*
Under conifers. A. *I. M.*

Hebeloma testaceum, *Batsch.*
A large fungus with a brick-red cap and rust-coloured gills. Smell strong, like radishes.
On the ground. A. *I. M.*

Coprinus domesticus, *Fr.*
Growing abundantly on an old charred stump in Queen's Cottage grounds. The plant was first observed on June 11th, 1912, after which the stump was kept under observation, and it was found that fresh fruit bodies of the fungus came up continuously until the last week of August, by which time the mycelium seemed to be exhausted. *E. M. W.*

Polyporaceæ.

Polystictus Wynnei, *Berk. and Broome.*
Forming thin, variously shaped expansious incrusting fallen branches, leaves, etc. When growing the colour is pale yellow, becoming primrose-yellow towards the edge. Dull ochre when dry. A. *I. M.*

Poria Vaillantii, *Fr.*
Forming large, easily separable sheets on some old planks. Q. *E. M. W.*

Thelephoraceae.

Peniophora longispora (*Pat.*) *v. Höhn.*

New to Britain. The species was originally described from Tunis, but is apparently not uncommon in Europe on bark and wood of various trees, having been recorded from Austria, Poland, and France.

It is a very marked species, with the habit of a *Hypochnus*, and differing from all other Peniophoras in its long, very slender spores, 12–17 × 2–2½μ. Q. *E. M. W.*

Corticium confine, *Bourd.* et *Galz.*

First described from France in 1911, but apparently not uncommon in Britain. Common in the grounds of Queen's Cottage on wood and bark of various trees. It is a thin, white species, superficially resembling young states of *Hydnum farinaceum*, with which it has probably hitherto been confused. Q. *E. M. W.*

This and the following species of *Corticium* were first added to the British Flora during the past year, but all appear to be fairly generally distributed, having been received from correspondents in various parts of the country.

Corticium botryosum, *Bres.*

Forming a thin, glaucous film resembling a mould, on very rotten wood. Q. *E. M. W.*

Distinguished from the following by the absence of clamp-connections at the septa.

Corticium subcoronatum, *v. H.* et *L.*

Occurs more commonly than *C. botryosum*, in similar situations, and has the same general appearance. Q. *E. M. W.*

Corticium albo-stramineum (*Bres.*) *Wakefield. Hypochnus-albo-stramineus*, Bres.

On fallen branches. Q. A. *E. M. W.*

Distinguished by the large, broadly-elliptical or subglobose spores, with dense, granular contents, which sometimes causes the epispore to appear slightly rough, and also by the presence of laticiferous (?) hyphae, with deeply staining contents ("gloeocystidia"). The latter character would place it in the genus Gloeocystidium of some Continental authors, but it is thought that the presence of these bodies alone in certain species of Corticium and Peniophora hardly justifies their separation as distinct genera.

Sphaeriaceae.

Clypeosphaeria Notarisii, *Fuckel.*

On dead bramble shoots. Q. *I. M.*

Pezizaceae.

Peziza adae, *Sadler.*

A very beautiful fungus, at first cup-shaped then gradually expanding until saucer-shaped or almost flat, with an irregularly wavy edge. Cream colour, more or less tinged with deep rose. The largest specimen was three inches in diameter. On soil in propagating pit. *C. P. R.*

Melanconiaceae.

Gloeosporium Crotolariae, *Massee.*

Maculae amphigenae, determinatae, primo suborbiculares dein irregulares, fuscescentes, saepius centro cinerascentes. *Acervuli* subcutanei dein erumpentes, roseo-tincti. *Sporae* oblongo-ellipticae, utrinque rotundatae, hyalinae, 25–28 × 7–8μ. in sterigmatibus hyalinis solitariae acrogenae.

Parasitic on young shoots of *Crotolaria juncea*, L., Sunn hemp. Small, more or less circular brownish patches first appear on the young shoots, these gradually increase in size and encroach on each other forming irregular patches. Just before the spore masses burst through to the surface, the central portion of the patches present a greyish appearance, due to the upraising of the cuticle. Brown patches appeared five days after the application of spores to the unbroken surface of the shoot.

Colletotrichum concentricum, *Massee.* Figs. 14–16.

Maculae amphigenae, effusae, arescenti-albae, eximie determinatae. *Acervuli* maculas totas occupantes, circinatim vel concentrice dispositi, aggregati, aurantiaci. *Sporae* ellipticae, utrinque rotundatae, rectae vel inaequilaterales, 21–28 × 7–8μ, hyalinae, in sterigmatibus filiformibus, hyalinis acrogenae. *Setulae* rectae, acuminatae, atro-brunneae, opacae, 80–100 × 6–7μ.

On the fruit of the Snake gourd, *Trichosanthes anguina*, L., in the Lilyhouse.

A destructive parasite forming large bleached patches on the fruit, which become covered with irregularly concentric rings of orange spore-masses. Spores placed on the unbroken surface of the fruit produced no result, but when introduced into the flesh on the point of a needle, the bleaching of the surface was apparent on the fourth day, and on the ninth day the orange spores, mixed with blackish spines, ruptured the epidermis and appeared on the surface of the fruit. *G. M.*

Hendersonia rubi, *Westend.* Figs. 11–12.

Forming whitish patches on the living shoots of brambles. This fungus has recently attacked cultivated raspberries and loganberries, and is a source of serious trouble in some parts of the country. The canes are attacked while quite young, and the presence of the fungus usually causes sterility. Q. *I. M.*

Hyphomycetaceae.

Brachysporium Wakefieldiae, *Massee.* Fig. 13.

Maculae sparsae, majusculae, villosulae, olivaceae. *Hyphae* cylindraceae, flexuosulae, simplices vel ramulosae, hic inde parce noduloso-geniculatae, septatae, olivaceae. *Conidia* acrogena, cylindrico-ellipsoidea, apice obtusata, laevia, 3-septata, loculis tribus internis obscure olivaceis, extimis pallidioribus, chlorinis, 23–25 × 7–8μ.

Forming scattered, olive coloured patches on the hymenium of a species of *Corticium*. Agreeing with *Brachysporium apicale*, Sacc., in having the apical cell of the conidium paler than the remainder, but distinguished by the much larger spores. Q. *E. M. W.*

Stemmaria aeruginosa, *Massee*. Figs. 1–3.

Stipes cylindraceus, erectus, ex hyphis tenuis septatis compositus, flavidus, circa 2 mm. longus, supra scopulato-ramosus, capitulum aeruginosum formans. *Conidia* concatenata, ellipsoidea, continua, flavida, 7 × 4μ, floccos moniliformes ex nodulis ramorum oriundos formantia.

On bird dung. First found by the late Mr. G. Nicholson, and recently met with again on the same substratum. Differs from *Stemmaria globosa*, Preuss, by the chains of conidia originating laterally, and in the smaller conidia. Q.

Arthrosporium elatum, *Massee*. Figs. 4–6.

Stipites gregarii saepe caespitulosi ac basi confluentes, cylindracei vel sursum subattenuati, apice penicillato-expansi, contextu fibroso-fasciculato flavo-brunneo, 0·5–1 mm. alto. *Conidia* hyalina, oblongo-clavata, 1-septata, 12–15 × 3μ.

This differs from typical species in having 1-septate spores, but conforms in all other respects.

On decaying fragments of grass. Q. *G. M.*

EXPLANATION OF FIGURES ON PLATE.

1. *Stemmaria aeruginosa*, Massee. Entire fungus, mag.
2. Portion of fertile branch of same, mag.
3. Portion of fertile branch of same, showing origin of chains of spores, mag.
4. *Arthrosporium elatum*, Massee, group of fungi, mag.
5. Fruiting head of same, mag.
6. Conidia of same, mag.
7. *Omphalia kewense*, Massee, nat. size.
8. Pileus of same, mag.
9. Section of pileus of same, mag.
10. Basidium and spore of same, mag.
11. *Hendersonia rubi*, Westend., on bramble stem, nat. size.
12. Spores of same, mag.
13. *Brachysporium Wakefieldiae*, Massee, spores mag.
14. *Colletotrichum concentricum*, Massee, fungus nat. size.
15. Spores and hymenial spine of same, mag.
16. Spores of same, mag.
17. *Laccaria nana*, Massee, fungus, mag.
18. Section of same, mag.
19. Basidium and spores of same, mag.
20. } Spores of same, mag.
20.*

XXXIII.—CONTRIBUTIONS TO THE FLORA OF SIAM. ADDITAMENTA, IV.

Lonicera siamensis, *Gamble* [Caprifoliaceae-Lonicereae]; *L. macranthae*, DC., affinis, foliis conspicue rugosis acutis nec acuminatis, corollae lobis brevibus latis et staminibus vix exsertis differt.

Frutex supra arbuscula vagans (ex *Kerr*), ramulis gracilibus fuscis molliter velutinis. *Folia* ovato-oblonga vel ovato-lanceolata, apice acuta et mucronata, basi cordata, 9–11 cm. longa (vetustiora forsan

majora), circa 4·5 cm. lata, chartacea, supra nitida, glabra, ob nervationem impressam bullosa, infra, praecipue ad nervos, molliter pubescentia, juniora supra ad nervos puberula, pallida, costa gracili; nervi laterales utrinque 5–6, curvati, nervulis multis subparallelibus inter se juncti, reticulatione areolata; petiolus subcrassus, 5–7 mm. longus, velutinus; ad nodos ramulorum supra folia foliola 2, minima, ovata. *Flores* albi, tandem flavescentes (ex *Kerr*), ad foliorum axillas bini, pedunculis 1–2 cm. longis; bracteae lanceolatae, 2 mm. longae, pubescentes; bracteolae ovatae, obtusae, vix 1 mm. longae. *Receptaculum* ovoideum, 2–3 mm. longum, fere glabrum. *Sepala* 5, triangularia, vix 1 mm. longa, pubescentia. *Corollae* tubus gracilis, cylindricus, 3–4 cm. longus, puberulus; lobi 5, quorum 4 brevissimi, 1–2 mm. longi et par exterius interioribus latius, quintus longior, angustior, recurvus. *Stamina* vix exserta, antheris oblongis 3·5 mm. longis. *Stylus* filiformis, staminibus aequilongus; stigma capitatum. *Fructus* ignotus.

Doi Wao, 1050 m., *Kerr* 2457.

Wendlandia floribunda, *Craib* [Rubiaceae-Rondoletieae]; ab affini *W. glabrata*, DC., floribus congestis, alabastris apice pilosis, corollae tubo graciliore recedit.

Arbor circiter 7·5 m. alta (ex *Kerr*); ramuli brunneo-corticati, internodiis brevibus. *Folia* oblanceolata, oblongo-oblanceolata vel elliptica, apice breviter acuminata, obtusiuscula, basi cuneata, 6–11·5 cm. longa, 2·6–4·3 cm. lata, coriacea, glabra, nervis lateralibus utrinque 6–8 supra conspicuis subtus prominentibus, nervis transversis uti reticulatione graciliore pagina utraque subconspicuis, petiolo 5–14 mm. longo glabro suffulta; stipulae diutius persistentes, apice cuspidato-subulato-acuminatae, basi 3 mm. latae, ad 4·5 mm. longae. *Panicula* terminalis, multiflora, ad 1·4 cm. longa et 1·3 cm. diametro; bracteae lineares, acutae, ad 2 mm. longae; flores sessiles vel perbreviter pedicellati. *Receptaculum* glabrum, 1 mm. altum. *Calycis* lobi deltoidei, acutiusculi, 0·5 mm. longi, pauci-ciliati. *Corolla* alabastro apice rotundata truncatave pilosaque; tubus 3·5 mm. longus, extra glaber, intra parce pilosus; lobi 0·5 mm. longi, circiter 0·5 mm. lati. *Antherae* sessiles, 0·75 mm. longae. *Stylus* 4 mm. longus, glaber, stigmatibus validis.—*W. glabrata*, DC., var. *floribunda*, Craib in Kew Bull. 1911, p. 386, et Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 100.

Chiengmai, Doi Sootep, in open jungle, 1440 m., *Kerr* 1674.

Jasminum Vanprukii, *Craib* [Oleaceae-Jasmineae]; ab *J. coarctato*, Roxb., cui affine, foliis majoribus, corollae puberulae lobis brevioribus latioribus inter alia differt.

Frutex scandens, cortice mox pallido (fide *Luang Vanpruk*), ramulis statu juvenili crispatim puberulis. *Folia* opposita vel subopposita, ima basi ramulorum fere ad squamas reducta, mediana suborbicularia vel late ovata, suprema oblonga vel oblongo-obovata, omnia parum tantum vel conspicue inaequilatera, apice acute acuminata, basi rotundata vel rotundato-cuneata, ad 16 cm. longa et 7 cm. lata, chartacea, glabra, nervis lateralibus utrinque ad 8 cum costa supra leviter immersis subtus prominentibus, nervis transversis supra conspicuis subtus prominulis, petiolo vix 1 cm. longo breviter pubescente suffulta. *Inflorescentia* terminalis, pedunculo communi

4·5–6 cm. longo puberulo suffulta, e cymis trifloris racemosim dispositis constituta ; bracteae anguste ellipticae vel ovato-lanceolatae, apice longe cuspidatim acuminatae, ad 1·8 cm. longae et 9 mm. latae ; cymulae pedunculo 8 mm. longo suffultae ; bracteae ad cymularum bases oblanceolatae, acuminatae, calycem subaequantes. *Calyx* extra puberulus, 8 mm. longus, lobis tenuibus tubo subaequilongis. *Corolla* alba (ex *Luang Vanpruk*), extra puberula ; tubus 2·5 cm. longus, vix 2 mm. diametro ; lobi circiter 8 mm. longi, 5 mm. lati.

Hui Ché, 300 m., *Luang Vanpruk* 315.

Aeschynanthus Garrettii, *Craib* [Gesneraceae-Cyrtandreae] ; ab *A. micrantha*, C. B. Clarke, floribus majoribus recedit.

Ramuli primo rubro-brunneo- mox pallide corticati, circiter 2·5 mm. diametro. *Folia* opposita, ovato-lanceolata, lanceolata, oblanceolata vel obovato-oblanceolata, apice obtuse acuminata, basi cuneata vel late cuneata, rarius rotundata, 2–7·2 cm. longa, 1·1–2·5 cm. lata, coriacea, nervis lateralibus utrinque circiter 4 plerumque omnino obscuris, costa supra impressa subtus prominente, pagina utraque glabra, margine undulata, recurva, petiolo 2–6 mm. longo supra canaliculato glabro suffulta. *Flores* axillares, solitarii ; bracteae parvae, deciduae ; pedicelli glabri, sub anthesin 1·1 cm. longi, infructescentes ad 1·8 cm. longi, paulo incrassati. *Sepala* libera, lineari-lanceolata, acutiuscula, inter se parum inaequalia, ad 7 mm. longa et 1·25 mm. lata, glabra, uninervia. *Corolla* 3·1 cm. longa, lobis exceptis glabra ; tubus ad 2·5 cm. longus ; labium superum rectum, e lobis duobus apice rotundatis circiter 3 mm. longis et 4 mm. latis constitutum ; lobi laterales reflexi, circiter 5 mm. longi et lati ; lobus anticus patens, 8 mm. longus, 5 mm. latus, lobis omnibus pilis septatis glanduloso-capitatis ciliatis. *Filamenta* ad 3·2 cm. longa, superne praecipue glanduloso-pilosa, antheris 2 mm. longis. *Ovarium* 1·5 cm. altum, glabrum, stipite 1 cm. longo suffultum ; stylus 1·4 cm. longus. *Fructus* ad 6 cm. longus, stipite 2·5 cm. longo suffultus ; semina pilo solitario utrinque instructa.

Doi Intanon, Pah Ngeam, west side of north rocks, 2080–2115 m., *Garrett* 86.

Aeschynanthus lineatus, *Craib* [Gesneraceae-Cyrtandreae] ; *A. Garrettii*, Craib, similis sed foliis majoribus, corolla minore eiusque lobis brevioribus satis distat.

Ramuli primo rubro-brunneo-corticati, mox pallidi, glabri, circiter 2·5 mm. diametro. *Folia* opposita, plerumque parum inaequilatera, lanceolata, oblonga, oblanceolata vel obovato-oblanceolata, apice acuminata, obtusiuscula, basi cuneata vel late cuneata, 4·8–9·3 cm. longa, 1·7–3·3 cm. lata, coriacea, pagina utraque glabra, nervis lateralibus obscuris, costa supra leviter impressa subtus prominente, petiolo 0·5–1·5 cm. longo supra canaliculato suffulta. *Flores* axillares, plerumque gemini ; pedicelli 7–10 mm. longi, glabri, bracteis parvis deciduis basi instructi. *Sepala* libera, linearia, obtusiuscula, ad 6·5 mm. longa et 1·25 mm. lata, glabra. *Corolla* ad 2·8 cm. longa, extra, superne praesertim, pilis transverse septatis glanduloso-capitatis instructa ; tubus ima basi circiter 2 mm., apice fere 8 mm. diametro ; lobi inter se subaequales, oblongi, apice rotundati, ad 2·5 mm. longi et lati, pilis transverse septatis glanduloso-capitatis parce ciliati,

utroque linea atro-rubra fere ad tubi medium decurrente inferne gradatim angustata medio ornato. *Filamenta* ad 3 mm. longa, antheris circiter 1·5 mm. longis. *Discus* ovarii stipitis basem laxe cingens, circiter 0·75 mm. altus. *Ovarium* circiter 1·2 cm. altum, glabrum, stipite fere 6 mm. longo gracili suffultum ; stylus 1·4 cm. longus, glanduloso-pilosus.

Doi Intanon, Pah Ngeam, west side of north rocks, 2090 m., *Garrett* 87.

Ruellia Kerrii, *Craib* [Acanthaceae-Ruellieae] ; a *R. suffruticosa*, Roxb., corolla majore distinguenda.

Caules prostrati (ex *Kerr*), primo pilis longiusculis divergentibus albis densius tecti, plus minusve glabrescentes. *Folia* lanceolata, late lanceolata vel ovato-lanceolata, apice acute acuminata, basi cuneata vel late cuneata, 6–10·5 cm. longa, 2·5–4·4 cm. lata, membranacea vel chartaceo-membranacea, pagina utraque sed inferiore costa nervisque tantum pilis longiusculis albis parce instructa, nervis lateralibus utrinque 5–6 supra conspicuis vel subconspicuis subtus prominulis, nervis transversis supra subobscuris subtus conspicuis, margine integra, ciliata ; petioli foliorum oppositorum parum inaequales, ad 2·2 cm. longi, pilis iis caulium similibus instructi. *Flores* axillares, solitarii, sessiles ; bracteolae geminae, sub anthesin spatulatae, 9 mm. longae, fructu ad 2 cm. (petiolo incluso) longae. *Calycis* tubus 5 mm. longus, lobi e basi circiter 2 mm. lata longe subulato-acuminati, inter se parum inaequales, ad 9·5 mm. longi, pilis subrigidis divaricatis plerumque circiter 1 mm. longis instructi. *Corollae* purpureae (ex *Kerr*) tubi pars basi aequalis 1·3 cm. longa, pars expansa 3 cm. longa ; lobi apice retusi, 1·4 cm. diametro. *Filamenta* glabra, antheris 3·25 mm. longis. *Ovarium* glabrum, stylo 4 cm. longo pilis suberectis albidis sparse instructo. *Capsula* 1·6 cm. longa.—*Ruellia* sp., Craib, Contrib. Fl. Siam in Aberd. Univ. Studies No. 57, p. 153.

Ban Na Gorge, 135 m., in bamboo jungle, *Kerr* 2175.

Daedalacanthus ciliatus, *Craib* [Acanthaceae-Ruellieae] ; a *D. nervoso*, T. And., cui affinis, bracteis ciliatis facile distinguendus.

Fruticulus circiter 30 cm. altus ; caules simplices, primo quadrangulares, mox fere teretes, circiter 2 mm. diametro, crispatim puberuli. *Folia* oblanceolata vel late oblanceolata, apice breviter vel vix acuminata, obtusa, basi cuneata, vel acuminata, 4–9 cm. longa, 1·4–3·4 cm. lata, chartacea, pagina utraque lineolata, glabra nisi subtus costa puberula nervisque lateralibus parce puberula, nervis lateralibus utrinque 6–7 cum costa supra conspicuis subtus prominulis, nervis transversis supra conspicuis subtus subprominulis, petiolo 0·7–1·3 cm. longo supra canaliculato puberulo suffulta. *Spicae* solitariae, terminales, vel raro et axillares, 4–5 cm. longae, ad 2 cm. diametro ; bracteae ovato-lanceolatae, apice subacuminatae vel attenuatae, obtusiusculae vel breviter apiculatae, basi cuneatae, ad 2·2 cm. longae et 8 mm. latae, dorso costa nervisque breviter pubescentes, margine conspicue longe ciliatae, albae, conspicue viridi-nervosae, nervis lateralibus utrinque circiter 6. *Calycis* scariosi tubus 1 mm. longus, lobi lineari-lanceolati, acuti, 3·5 mm. longi. *Corollae* tubus vix 3 cm. longus, lobi ad 8 mm. longi, 6·5 mm. lati. *Ovarium* glabrum, 2·75 mm. altum ; stylus 2·8 cm. longus, pilis brevibus sparse instructus.

Nan, by edge of stream in evergreen jungle, 195 m., *Kerr* 2398.
Distr. Upper Burma: Myitkyna, *Lace* 5161.
Lao name, Cha hawm (ex *Kerr*).

Hemigraphis hispidula, *Craib* [Acanthaceae-Ruellieae]; facie *H. hirtae*, T. And., similis sed ramulorum pilis rigidioribus, foliis majoribus longius petiolatis pagina superiore pilis paucioribus aequabilibus instructis distinguenda.

Ramuli nodis inferioribus radicantes, pilis albidis rigidis divaricatis hispiduli; innovationes pilis niveis dense tectae. *Folia* opposita plus minusve inaequalia, ovato-lanceolata, ovata vel subrotundata, apice obtusiuscula, basi cuneata, late cuneata vel rotundata, 2·5–6 cm. longa, 1·8–3·3 cm. lata, rigide chartacea, pagina utraque pilis albidis longiusculis rigidis parce instructa, nervis lateralibus utrinque 6 pagina utraque prominulis, nervis transversis infra conspicuis, margine crenata vel crenato-serrata, nunquam serrata, petiolo ad 2 cm. longo hispidulo suffulta. *Sepala* 5, lineari-lanceolata, acuta, 5 mm. longa, 0·75 mm. lata, superne pilis albidis rigidis longiusculis divaricatis instructa, inferne ciliata. *Corollae* tubus 9 mm. longus, 2 mm. e basi ampliatus; lobi 5, inter se subaequales, oblongi, apice rotundati, ad 2·5 mm. longi et 2 mm. lati. *Filamenta* glabra, longiora circiter 2 mm. longa, minora duplo superantia. *Ovarium* 1·5 mm. altum, superne puberulum, 8-ovulatum; stylus apice incrassatus, 7·5 mm. longus, puberulus.

Between Prê and Nan, Hui Mê Sakawn, in evergreen jungle, covering the ground in places, 420 m., *Kerr* 2383; Nan, common in mixed jungle, 195 m., *Kerr* 2383a.

Aristolochia siamensis, *Craib* [Aristolochiaceae]; foliis tenuibus late cordatis distincta.

Caules scandentes, ad 4 mm. diametro, pallide brunnei, plurisulcati. *Folia* late cordata, apice acuta, sinu basali ad 3 cm. alto et 2·7 cm. lato, circiter 16 cm. longa et lata, chartacea, pagina superiore glabra, inferiore costa nervisque brevissime adpresse pubescentia praetereaque hic illic setulis albis sparsissime instructa, e basi trinervia, nervis inferioribus cito furcatis supra conspicuis subtus prominentibus, nervis transversis supra conspicuis subtus prominulis, petiolo circiter 5 cm. longo sulcato pilis brevibus adpressis albidis plus minusve deciduis instructo suffulta. *Inflorescentia* axillaris, multiflora, petiolos subaequans, ad 11 cm. diametro; bracteae parvae; pedicelli circiter 0·8–1·3 cm. longi, ut pedunculi bracteaeque pilis brevibus albidis adpressis instructi. *Receptaculum* 1 cm. altum, 1 mm. diametro, sulcatum, ut pedicelli pubescens. *Calycis* brunnei (ex *Kerr*) pars ima basi tubulosa vix 4 mm. longa; utriculus ovoideus vel globoso-ovoideus, ad 6 mm. altus et 5 mm. diametro; tubus superne dilatatus 1·8–2 cm. longus, medio 1–1·25 mm. diametro, pilis ut utriculus pedicellique instructus; limbus oblongus, apice breviter acuminatus, inferne attenuatus, 2 cm. longus, 1 cm. latus. *Corona* 6-lobata.

Mê Ping Rapids, Fa Man, 180 m., *Kerr* 2195.

Phoebe Kerrii, *Gamble* [Lauraceae-Cinnamomeae]; *P. declinatae*, Nees, affinis, ramulis et foliis siccis et paniculis pallidis glabris, floribus majoribus, foliis summo apice obtusioribus differt.

Arbor parva ; ramuli mediocriter crassi, cortice albescente lucido. *Folia* oblanceolata, apice obtuse acuta, basi attenuata, 9–13 cm. longa, 2·5–5 cm. lata, chartacea, glabra, supra lucida, infra pallida, costa pagina utraque conspicua siccitate flavescente, nervis lateralibus utrinque 9–10 ad marginem curvatis et ibi gradatim arcuatis ; reticulatio conspicue areolata ; petiolus 1·5 cm. longus, flavescens, supra canaliculatus. *Flores* virescentes, in paniculas paucifloras glabras e foliorum ultimorum axillis ortas 6-7 cm. longas dispositi ; pedunculi 2–4 cm. longi, ramis brevibus et cymulis terminalibus 2–3-floris ; pedicelli circa 5 mm. longi. *Perianthii* tubus brevis ; lobi ovati, obtusi, 3 exteriores 3 mm. longi, interiores 4 mm. longi, intus sericei. *Stamina* inclusa, glabra, ordinum I. et II. 3·5 mm. longa, antheris oblongis et thecis ellipticis, ordinis III. 3·5 mm. longa, angustiora, thecis oblongis et glandulis 2 globosis glabris ad filamentorum basim positis ; ordinis IV. staminodia hastata, vix 2 mm. longa, glabra. *Ovarium* globosum, glabrum, stylo gracili, stigmate parvo subrecurvo. *Drupa* non visa.

Chiengrai, in deciduous forest on the edge of a marsh, 360 m., *Kerr* 2502.

Litsea Garrettii, *Gamble* [Lauraceae-Litseae] ; *L. amarae*, Blume, affinis, foliis oblanceolatis acuminatis subtus tomentosis, racemis paucifloris antheris acutis et glandulis minimis stipitatis, perianthii tubo fructifero cupuliformi lobis deciduis differt.

Arbor 4–5 m. alta ; ramuli graciles, nigrescentes, ultimi pallide puberuli. *Folia* alterna, elliptica vel elliptico-oblanceolata, apice cuspidato-acuminata, basi acuta, 8–16 cm. longa, 3·5–6 cm. lata, chartacea, supra olivacea, nitida, subtus ferrugineo-tomentosa, tandem glabrescentia, viridia, costa gracili supra impressa, nervis lateralibus utrinque 6–8 curvatis prope marginem arcuatim junctis, nervulis transversis conspicuis ramosis, reticulatione conspicue areolata ; petiolus 1–1·5 cm. longus. *Flores* in umbellulis circa 4-floris in racemos axillares 1·5 cm. longos dispositis ; pedunculi graciles, 8 mm. longi, puberuli ; bracteae involucrales 4, ovatae, concavae, reflexae, 5 mm. longae, extra pallide puberulae ; pedicelli vix ulli. *Perianthii* tubus in flore ♂ brevissimus, in flore ♀ infundibularis, 2 mm. longus ; lobi 6, oblongi, obtusi, extra sericei, in ♂ 5 mm., in ♀ 2–3 mm. longi. *Stamina* floris masculi 9, ordinum I. et II. 6 mm. longa, filamentis gracilibus hirsutis et antheris anguste ovatis apice acutis, ordinis III. 5 mm. longa, filamentis hirsutis, antheris ovatis acutis, glandulis 2 minimis reniformibus stipitatis ad basem filamentorum. *Ovarii* rudimentum deficiens. *Staminodia* floris feminei 9–12, ordinum I. et II. clavata, 1·5 mm. longa, parce hirsuta, ordinum III. et IV. breviora, subulata, glandulis 2 parvis stipitatis prope basem instructa. *Ovarium* ovoideum, glabrum, stylo crasso curvato, stigmate peltato. *Drupa* oblonga, 1–1·5 cm. longa, 5–6 mm. diametro, pericarpio laevi nigrescente, in perianthii tubo incrassato cupuliformi ore 6 mm. diametro insidens ; pedicellus incrassatus, 8 mm. longus.—*Litsea* sp., Craib in Kew Bull. 1911, p. 452, et Contrib. Fl. Siam in Aberd. Univ. Studies, No. 57, p. 177.

Doi Intanon, *Garrett* 63 (♂), Chiengmai, Doi Sootep, 900–1650 m., in evergreen forest, *Kerr* 880, 2541, 2602 (♀).

XXXIV.—A NEW GRASS PARASITE.

(*Cladochytrium graminis*, Büsgen.)

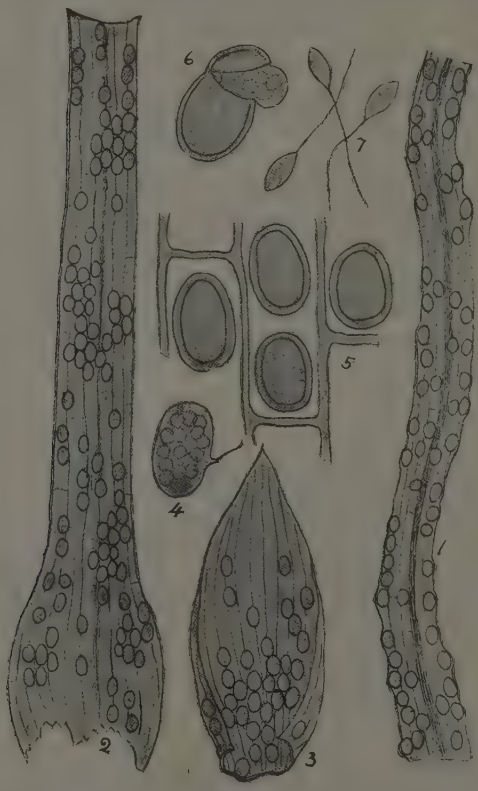
G. Massee.

The parasite was first observed in this country in 1908, when a sod of diseased grass was sent to Kew for determination. In connection with this it was stated that the disease had appeared in every instance, where portions of a consignment of continental grass seed had been sown. The spread of the disease was checked by the removal and burning of all diseased patches, and nothing more has been heard of the parasite until the present season, when its presence has been notified at Kew from several widely separated localities in the south of England. At present the parasite has only been observed to attack species of *Festuca* and other grasses with small leaves, and is consequently most prevalent on lawns, tennis grounds, bowling-greens, &c. The symptoms of its presence are the appearance of small yellowish patches a few inches across scattered over the lawn. These patches gradually increase in size and often encroach on each other, forming large irregularly shaped areas which eventually become brown owing to the entire disappearance of the grass.

The fungus under consideration, like the one causing "damping off" in seedlings, belongs to a primitive type, in which the reproductive bodies called zoospores possess the power of spontaneous movement in a film of water, by which means they are enabled to migrate from their place of origin, and infest adjacent plants. This peculiarity explains the observation made by a correspondent, that the disease spreads most rapidly after a fall of rain. The root of the grass is the part first attacked. As the result of infection a very slender, branching mycelium spreads in the tissues, which gives origin to numerous thin-walled zoosporangia, from which zoospores are liberated. These in turn infect the roots of neighbouring plants, thus a single infected plant, acting as a centre of disease, may lead to the destruction of the grass extending over a large area when weather conditions favour the dispersion of the zoospores. At a later stage myriads of thick-walled resting-spores are formed in the tissues of the root and of the lower leaves that are lying on the ground. In rare instances resting-spores are also present in the flowering glumes and in the "seed" coat. This probably only happens when the inflorescence has by some means been pressed close to the ground, where the zoospores would be able to reach it. Where infected plants die the resting-spores are set free in the soil, which is invariably infected after the growth of a diseased crop. The resting-spores remain in the ground for some time in an unchanged condition, and on germination liberate zoospores, which are capable of attacking the roots of grass and causing a new outbreak of the disease.

Seed of *Poa annua* and of *Festuca ovina*, sown in soil infected by mixing with it a broken up sod of diseased grass produced diseased plants, whereas *Dactylis glomerata*, and *Triticum caninum*, sown in infected soil, remained free from disease. Control sowings of the four grasses in uninfected soil remained healthy.

Microscopic examination of a sample of grass seed that had produced a diseased crop, showed that only about five per cent of the seed contained resting-spores of the fungus in the seed coat.



1. Resting-spores in fragment of grass root × 65.
2. Resting-spores in fragment of grass leaf × 65.
3. Resting-spores in flowering glume × 65.
4. Zoosporangium containing zoospores × 400.
5. Resting-spores in cells of leaf × 400.
6. Resting-spore commencing to germinate × 400.
7. Free zoospores × 600.

This percentage, however, is more than sufficient to set up diseased patches at intervals in the seed-bed or lawn. These would serve as starting points from which the parasite could spread in every direction, more especially during a rainy season.

A plot of *Poa annua*, grown in infected soil, showed the presence of the disease in a few scattered plants when seven weeks old. It was found that by watering the soil with a solution of sulphate of iron—half a pound to a gallon of water—the spread of the disease was checked.

A second plot of *Poa annua*, grown in infected soil, but not treated, was killed by the parasite.

The treatment should follow a rainfall, or a thorough soaking of the ground with water, for the reason already given. It is important that the treatment should be repeated two or three times, according to circumstances, at intervals of about ten days as free zoospores only are killed, and these are liberated at intervals.

It is very doubtful as to whether any known method of seed sterilisation would prove of value, as the thick-walled resting-spores are imbedded in the tissues of the seed, whereas the spores of "smut," "bunt," &c, where proper treatment proves effective, are not so thick-walled, and lie free on the surface of the seed.

Now that the disease is undoubtedly present, and perhaps to a greater extent than is realised, the most certain method for preventing its wholesale distribution turns on the selection of seed from districts free from the disease, and as the symptoms are so evident in the field and so readily corroborated, or otherwise, in the laboratory, this should prove a comparatively easy matter.

This parasite has probably been introduced from the Continent. It is not known as an indigenous British fungus, and was first found by De Bary in Germany.

XXXV.—CEDAR WOODS.

W. Dallimore.

The frequency with which the word cedar is used in connection with various kinds of timbers suggested the compilation of a list of the trees to which the name is applied, and in the following notes attention is directed to the various species and their uses. Except in those instances where the wood is generally known as cedar, references are given to works in which the name is used, and in each case the information has been extracted as far as possible from the books where the names occur.

There appears to be little doubt that the name was originally used in connection with the cedar of Lebanon, and that, by reason of its association with Biblical history, is the most widely known cedar of the present day although its wood is one of the least important of the many which now bear the name of cedar. The chief reason for the adoption of the name for many kinds of woods appears to be that they possess an odour very like that of the cedar of Lebanon, but in other cases a real or fancied resemblance between the leaves or the bark of two trees has been found a sufficient reason for the name. Then again the name appears to have been given to some woods in order to try and create a market for the timber, whilst in other instances there does not appear to be any good explanation for the use of the word. From these several reasons, the name of cedar has been brought into use for trees and woods which are totally distinct in habit and structure, belonging to widely different families and coming from many different parts of the world. In the following notes the various trees to which the name of cedar is applied are arranged in their respective Natural Orders.

Meliaceae.

Dysoxylum Fraseranum, *Benth.*—Pencil Cedar, Rosewood, Mocondie.

According to Stone, "Timbers of Commerce," p. 40, the name of pencil cedar is applied to the wood of this tree, although Maiden refrains from its use and contents himself by saying that it is somewhat like red cedar. Both Maiden and C. Moore, the latter in the "Catalogue of Woods from the Northern District of New South Wales, sent to the London Exhibition of 1862," refer to it as rosewood and mocondie. Moore gives the scientific name as *Synoum glandulosum*; but Maiden, "Forest Flora of New South Wales," iii, pt. xxiii, No. 83, indicates that the name was given in mistake for that of *Dysoxylum Fraseranum.*

The tree is found in the richer or "cedar brush" forest regions of New South Wales and also in southern Queensland, where, under suitable conditions, it attains a height of 80 to 140 feet and a girth of 15 to 20 feet, although trees have been measured with a girth of 40 feet. Of twelve trees measured in one district, the average girth is given as 16 feet. The wood is described as moderately hard, straight-grained, easy to work, taking a good polish and weighing 41 to 44 lbs. a cubic foot when dry. Stone gives the weight as about 56¼ lbs. a cubic foot, but he does not say that the wood was seasoned. It is used for furniture, cabinet work, shop fittings, panelling for houses and steam boats and for other purposes. Specimens in the Kew Museums show reddish heart-wood and yellowish sapwood, but the colour fades with long exposure to light.

When freshly cut the wood has a rose-like scent from which the common names of rosewood and cedar have originated. Maiden refers to the wood having an oily character, which is considered a disadvantage as it prevents its taking glue well. As the result of an enquiry made by the Minister for Lands, New South Wales, the stock would appear to be very considerable, for one district alone is said to be capable of supplying 15,000,000 feet. A description of the tree as growing in Queensland is to be found in the "Catalogue of Queensland Woods, exhibited at the Colonial and Indian Exhibition, London, 1886," by F. Manson Bailey.

Dysoxylum spectabile, *Hook.*—Cedar.

This tree is described as cedar by Mr. and Mrs. E. H. Featon in "The Art Album of the New Zealand Flora," (1889). The native name of "kohekohe," is also given and the tree is described as being most common in the Northern Island, occurring rarely in the northern part of the Middle Island. At its best it attains a height of 50 feet with a diameter of 3 feet. The handsome, pinnate leaves peculiar to the genus, are present in this species and the small white flowers are produced in large panicles. These are followed by greenish fruits, which open when ripe and disclose the seeds covered with an orange or reddish aril. The wood is reddish in colour, close-grained, and used for furniture and fencing, but its durability is questioned. Wood, bark, flowers and leaves are credited with stomachic properties. *D. spectabile* is described

by Stone, "Timbers of Commerce," p. 42, where the common name of redheart is given. A further description of the species occurs in "A Manual of the New Zealand Flora," pp. 95–96, by T. F. Cheeseman.

Dysoxylum Muelleri, *Benth.*—Cedar, Pencil Cedar, Bastard Cedar, Red Bean.

This tree grows in the rich forest region of northern New South Wales and S. Queensland, and is met with between 50 and 70 feet in height with a trunk 3 feet or more in diameter. The pinnate leaves are up to 2 feet long and composed of an indefinite number of ovate or lanceolate leaflets 3 to 6 inches in length. The heart-wood is red in colour, nicely marked but odourless, the name of cedar having been given on account of a fancied resemblance between the grain of the wood and that of the American cedar or juniper which is used for pencils. Moore refers to the wood under the name of *Synoum Lardneri* in the 1862 Exhibition Catalogue (see "Indigenous Woods of New South Wales, Northern District," p. 52, No. 51), and gives the common name of "turnip wood." With reference to this he says that the bark smells somewhat like a Swedish turnip. He describes the wood as being useful for housework and general purposes. Recent descriptions place it with good furniture woods. Good accounts of the tree and its wood are given by J. H. Maiden in his "Forest Flora of New South Wales," iii, pt. xxvii, No. 97, and by F. Manson Bailey in the "Catalogue of Queensland Woods" previously referred to, p. 11, No. 61a.

Dysoxylum rufum, *Benth.*—Bastard Pencil Cedar.

These names are coupled by Maiden, "Forest Flora of New South Wales," iii, pt. xxiv, No. 86, pp. 63–64. The tree is described as a large one growing 80 to 100 feet high with a girth of from 6 to 10 feet. It resembles other species in its large, handsome, pinnate leaves, but differs by having the under sides of the leaves, inflorescences, fruit and young shoots covered with a dense brownish tomentum, and by the flowers, fruits and wood when fresh being attended by a disagreeable onion-like smell. The sapwood is said to be white and the heart-wood red or reddish brown. The latter is nicely marked and is used for cabinet making and other purposes. According to Bailey's "Synopsis of the Queensland Flora," this species is found in Queensland forests as well as in those of New South Wales.

Dysoxylum malabaricum, *Bedd.*—White Cedar.

Reference is made to this tree by Gamble in "A Manual of Indian Timbers," p. 148. He described it as a very large tree with light, close-grained, hard, elastic wood, which is sweet-scented, and used for oil-casks. The tree is said to inhabit the forests of the Western Ghâts, Coorge, Malabar, the Anamalai Hills and Travancore at elevations of 1000–3000 feet. A suggestion is also made that the name of white cedar may sometimes be applied to a species of *Chisocheton.*

Cedrela Toona, *Roxb.*—Cedar, Red Cedar, Moulmein Cedar.

This tree is widely distributed in India, Burma, Queensland and New South Wales, but in Australia the synonymous name of

C. australis is often used. It is one of the most important of the Old World cedars and is considered to be one of the most valuable woods of New South Wales. The tree varies greatly in size, but is often found from 90 to 120 feet high with a diameter of 4 to 6 feet. It sometimes, however, exceeds 200 feet in height with a diameter of 10 feet. Maiden, "Forest Flora of New South Wales," i, pt. iii, No. 9, pp. 55–63, refers to one which is calculated to yield 30,000 feet of saleable timber when cut down, and to another which yielded 80,000 feet. The latter tree was cut off at 10 feet from the ground and measured 60 feet to the first branch.

The heart-wood is reddish in colour, prettily marked, especially in some cuts, is easily worked, carves well, and is employed for all kinds of furniture and cabinet work, panelling, &c., whilst it is considered to be one of the best of the Australian woods for carriage building and fittings for expensive houses. In India it is said to be very popular for tea boxes and cigar boxes in addition to the above-mentioned purposes. Several specimens, plain and polished, are to be seen in Museums I and III, at Kew. Polished wood bears a resemblance to mahogany, and the choicest furniture wood is said to be that from the junction of branches and trunk, for in such places it is very prettily curled. As a rule such sections are cut into veneer. An account of the tree as found in India is given in "Gamble's Manual of Indian Timbers," pp. 157–159.

Cedrela odorata, *L.*—Havannah Cedar, Barbados Bastard Cedar, Cuba Cedar, Honduras Cedar, Mexican Cedar, Jamaica Cedar, West Indian Cedar, Cedar.

The commercial importance of the wood of this S. American and West Indian tree has resulted in the numerous common names by which the timber is known. As in the case of the Australian and Indian *C. Toona*, *C. odorata* grows to a large size, and logs nearly 30 feet in length squaring up to 2 feet are imported into this country. The reddish-brown wood, although softer, is of almost as much importance for the manufacture of furniture, and for house and shop fittings, as true mahogany, while it is used very extensively in the manufacture of cigar boxes. Descriptions of the wood are given by Stone in "Timbers of Commerce," p. 36, and by Batterden in "Timber," p. 150.

Cedrela fissilis, *Vill.*—Cedro.

A specimen of the wood of this tree was received at Kew some years ago from Mr. G. Paddison. The section was brought from Paraguay, and the donor reported that it was obtained from a lofty tree, and that the wood was used for planks in ship-building, frames, carvings, canoes, and for every description of furniture. It is said to have a disagreeable, garlic-like smell when fresh, but nothing can be detected from the Kew specimen.

Owenia cepiodora, *F. Muell.*—Bastard Cedar, Bog Onion, Onion Wood.

Maiden says, "Forest Flora of New South Wales," iv, pt. xxxi, pp. 1–3, that the timber of this tree is a useful wood of the cedar class and that it is often sold as bastard cedar. It forms a tree up to 100 feet in height, with a diameter of 18 inches. Like many other trees in Meliaceae it bears handsome pinnate leaves and large

panicles of small flowers. The most familiar names of the tree are bog onion and onion wood, names which have arisen on account of the onion-like odour which is noticeable in newly-cut wood. The odour is said to disappear quickly, however, and to be no detriment to the value of the timber, which is used for cabinetwork, furniture, &c. Maiden records a curious character of the wood. This is, that although the wood when newly cut has usually a disagreeable smell, it is sometimes quite fragrant and suggestive of that of ripe water melons. A specimen of the wood in Museum No. I at Kew, shows it to be prettily marked with a satiny lustre.

Melia Azedarach, *L.* and **M. Azedarach**, *L.* var. **australasica**, *C. DC.*—Bastard Cedar, White Cedar, Bead Tree.

For all practical purposes these two trees may be considered together, for as Maiden indicates in his description of the latter tree, "Forest Flora of New South Wales," iii, pt. xxv, No. 92, p. 93, they are practically identical. *M. Azedarach* is a familiar decorative greenhouse plant in this country, being often grown under the name of Persian lilac. In Australia, India and other countries, it forms a tree up to 60 feet in height with a trunk 2 feet or so in diameter. Its compound leaves, which are large and ornamental, are made up of a considerable number of lance-shaped leaflets which vary in size, but are often 1½ or 2 inches long. The flowers are fragrant, whitish heavily shaded with lilac, or lilac throughout, and are borne in large panicles from near the ends of the branches. They are followed by yellow, berry-like fruits containing small hard seeds which are sometimes threaded and used for beads (see specimens in Museum No. I, at Kew). The fruits appear to be highly poisonous to human beings and animals although some birds are said to feed on them without inconvenience. Maiden, l.c. pp. 95–96, has collected a good deal of evidence relating to the poisonous nature of the fruit, and amongst other animals, pigs appear to be very susceptible to the effects of the poison. The juice of the bark and leaves has been collected by the Queensland natives and used for poisoning fish. Moore described the timber for the 1862 Exhibition Catalogue as being soft, easily worked, and principally used for shingles which are of an inferior kind. Subsequent descriptions from Australian sources are not in a more favourable vein, but Gamble, "A Manual of Indian Timbers," speaks rather more encouragingly about it. A specimen of white cedar in Museum No. III, at Kew, is named *M. composita*, Willd., and *M. composita* is also referred to as white cedar in "Bailey's Synopsis of the Queensland Flora," p. 60, and in his "Catalogue of Queensland Woods exhibited at the Colonial and Indian Exhibition, London, 1886." As Maiden, however, indicates, *M. composita*, Willd., is now considered as a synonym of *M. Azedarach*.

Flindersia australis, *R.Br.*—Red Cedar.

This species is described by F. M. Bailey in his 1886 "Catalogue of Queensland Woods," and is sometimes called Crow's Ash. Forming a medium-sized tree, it is described as having pinnate leaves made up of from 3 to 6 oblong leaflets, and producing white flowers in rather dense clusters. The wood is yellow, close-grained, very hard, and of great strength and durability.

Chickrassia tubularis, *Ad. Juss.*—Cedar, Bastard Cedar.

In "Balfour's Timber Trees," 3rd ed., (1870), p. 71, the wood of this tree is recorded as cedar, bastard cedar and deodar, probably on account of its wood having a scent somewhat like that of *Cedrus Deodara*. It forms a large tree, considerably over 100 feet high, with a long straight trunk and large handsome leaves. The wood is hard, brownish in colour, works with a fine smooth surface, and is said to be used largely in India for furniture and carving. Its distribution is given as the forests of the Sikkim Himalaya; Assam, Eastern Bengal, and Chittagong, throughout S. India, Ceylon, Burma, and the Andaman and Cocos Islands.

Guarea, **Trichilia** and **Pseudocedrela** are three genera belonging to Meliaceae which, according to Mr. H. N. Thompson, "Gold Coast Report on Forests," 1910, furnish the timber which is known as West African cedar. The particular species are not dealt with.

Leguminosae.

Acacia elata, *A. Cunn.*—Cedar, Cedar Wattle, White Cedar Wattle.

The several common names by which this tree is known, are said to have been applied many years ago on account of its leaves bearing some resemblance to those of the better known Australian cedar trees, rather than from any similarity between the woods. In the "Forest Flora of New South Wales," iii, pt. xxii, No. 82, pp. 23–25, Maiden describes it as a handsome tree 60 feet or more high with pinnate leaves and inflorescences six inches long of globular flower heads. The timber is light coloured and of little merit. Maiden refers to the bark as being fairly rich in tannin. The species is said to be confined to New South Wales.

Albizzia Toona, *Bail.*—Acacia Cedar, Mackay Cedar.

This tree is described by F. M. Bailey in the Supplement to his "Synopsis of the Queensland Flora", and is also mentioned on p. 30 of his 1886, "Catalogue of Queensland Woods." He describes it in the latter place as a large tree with a dense head of dark foliage and rusty shoots. The leaves are feathery and made up of numerous small, more or less downy leaflets. The wood is described as of a light brown colour for several inches in from the bark, the rest resembling red cedar, It is considered to be a valuable wood for furniture and other work.

Anacardiaceae.

Rhodosphaera rhodanthema, *Engl.*—Yellow Cedar, Bill-boy Cedar, Light Yellow-wood, Deep or Dark Yellow-wood.

F. Manson Bailey in his "Synopsis of the Queensland Flora," p. 83, and in his 1886 "Catalogue of Queensland Woods," uses Mueller's name of *Rhus rhodanthema* for this tree with the common names of yellow-wood; but Maiden, "Forest Flora of New South Wales," i, pt. viii, No. 30, p. 181, and ii, pt. xx, p. 199, refers to it under the other common names quoted above. The species is

mentioned as a tree 50 to 60 feet high, bearing pinnate leaves, made up of 7 to 9 leaflets, each of which is from 2 to 3 inches long. The red flowers are borne in dense bunches and are followed by brown and glossy globose fruits. The timber is not represented at Kew, but it is described as rich dark yellow or bronze in colour, prettily grained and highly prized for cabinet work, railway carriage fittings, turnery and picture frames.

Araliaceae.

Panax elegans, *C. Moore* and *F. Muell,* and **P. Murrayi,** *F. Muell.*—Pencil Cedar, Black Pencil Cedar.

Maiden refers to both these trees as cedars in the "Forest Flora of New South Wales," i, pt. vi, No. 23, pp. 138–143, but Bailey in his "Catalogue of Queensland Woods" uses the alternative name of "mowbulan whitewood", and does not connect them with the cedars. In the latter work *P. elegans* is described as a tall and sometimes large tree with very large, wide-spreading leaves, much divided into ovate leaflets. It is found in all the coast scrubs of Queensland, also in New South Wales. The wood is soft, light, elastic and has been suggested as a substitute for willow for cricket bats in addition to being used for lining boards. It has also been recommended as a likely wood for musical instrument makers. *P. Murrayi* is described as a handsome tree with large leaves. The wood is light in colour and weight and has been suggested as likely to form good lining boards. A sample of the wood of the latter tree is to be seen in Museum No. I, at Kew, but it does not give one the impression as being either distinct or good enough to import into European countries.

Celastraceae.

Elaeodendron australe, *Vent.*—White Cedar, Blue Ash.

A description of this tree is to be found in Bailey's, 1886, "Catalogue of Queensland Woods," but the common names are not mentioned there. They occur in Maiden's "Useful Native Plants of Australia," p. 423. The tree is described as from 24 to 30 feet high with a trunk 4 to 12 inches in diameter. The wood is pinkish in colour, close-grained, tough, useful for staves, oars, shingles and tool handles. Bailey says that it warps a good deal in drying if cut before it is seasoned.

Boraginaceae.

Ehretia acuminata, *R. Br.*—Brown Cedar.

Mention is made of this tree in Bailey's, 1886, "Catalogue of Queensland Woods," p. 60. It is described as a small tree inhabiting creek sides in South Queensland, New South Wales and Victoria. In "Useful Native Plants of Australia," p. 421, Maiden says that it grows 20 to 30 feet high, furnishing a light brown, coarse-grained wood which is easy to work and closely resembles English elm.

Euphorbiaceae.

Phyllanthus Ferdinandi, *F. Muell.*—Pencil Cedar.

The name of pencil cedar is applied to the wood of this tree in "Useful Native Plants of Australia," p. 586. It forms a tree up to 70 or 80 feet high with a trunk 12 to 18 inches in diameter, and Bailey, in his "Catalogue of Queensland Woods" (1886), p. 73, describes it as follows. "A moderate-sized tree, with lively green foliage, the branchlets often reddish. Leaves oval-oblong, usually 3 or 4 inches long, but at times much longer. Flowers in the axils, or some distance up the stem towards the next leaf, very irregular, even on the same tree, in this respect. Along creek sides throughout Queensland; also in N. Australia and New South Wales. Wood easy to work, close in the grain, and of a grey colour; warps in drying."

Rutaceae.

Pentaceras australis, *Hook. f.*,—Scrub White Cedar.

This tree is referred to in Maiden's "Useful Native Plants of Australia," p. 584. The timber is described as close-grained, tough and firm, and the tree is said to attain a height of from 40 to 60 feet with a trunk diameter of 12 to 24 inches.

Rubiaceae.

Hymenodyction excelsum, *Wall.*—Cedar Wood.

This tree is referred to in "Balfour's Timber Trees," 3rd ed., (1870), p. 137, as cedar wood, but neither Gamble nor Brandis recognise the name. It is described by Gamble as a large deciduous tree native of the Sub-Himalaya, and lower Himalaya from the Ravi eastwards, ascending to 5000 feet; Central, Western and Southern India; dry forests in Burma. The wood is white or brownish and is used for packing cases and other minor purposes.

Urticaceae.

Ulmus americana, *L.*—Michigan Cedar, White Elm.

A recent reference to the wood of the white elm being called Michigan cedar was noted in the "Timber News" for February 13th, 1913, p. 4. It is there stated that one of its latest reported uses is the manufacture of cigar boxes, for which purpose it is stained red. Cigar boxes made from this wood are to be seen in Museum No. I, at Kew, where they have been on view for several years. *Ulmus americana* is widely distributed in North America where it forms a tree up to 100 feet in height with a diameter up to 7 or 8 feet. It thrives best on rich, moist ground and is useful for all the purposes for which the European Elms are employed.

The wood is heavy, strong and coarse-grained, light brown in colour with yellowish sapwood, Amongst other uses it is employed for hubs of wheels, boat building, coffin boards, and flooring. It does not possess the fragrance which is usually associated with cedar woods, but in its use for cigar boxes fragrance is introduced with the staining matter.

Ulmus crassifolia, *Nutt.*—Cedar Elm.

This species is referred to as cedar elm in several American publications. It is found in Arkansas, Texas, Mexico and other places as a small tree 30 to 40 feet high with a trunk 2 to 3 feet in diameter. The wood is described as reddish-brown, rather weak and used locally for furniture and hubs.

Saxifragaceae.

Cunonia capensis, *L.*—Red Cedar, Cape Red Cedar, Red Alder, Red Els.

This South African tree is described by Stone in "The Timbers of Commerce," pp. 109–110, as red cedar, but Sim, in "The Forests and Forest Flora of Cape Colony," p. 217, uses the apparently more familiar Cape names of red alder and red els. Sim describes the species as a small evergreen tree growing up to 50 feet high with a short bole sometimes 3 to 4 feet in diameter. It appears to attain its largest proportions in Kaffraria, where it is found at altitudes varying from 2000 to 5000 feet, rarely within 40 miles of the sea. In Pondoland, where it approaches within a few miles of the sea, it is said to occur as a stunted specimen. It occupies open country rather than dense forest and is reputed to be a good fire resister. The wood is red in colour and has been compared to boxwood in hardness; it takes a good polish and is suitable for furniture, spokes and turnery. The South African Forest Department encourages the planting of this tree.

Sterculiaceae.

Guazuma tomentosa, *H.B.K.*—Bastard Cedar.

In the Index to the common names of plants described in "Griesbach's Flora of the British West Indies," this tree is referred to as bastard cedar. Usually met with from 15 to 20 feet in height, it occasionally attains a height of 50 feet. It is widely distributed in Tropical America and the West Indies and as an introduced tree in India, Java, &c. Gamble, in "A Manual of Indian Timbers," says that the wood is used for panels of coaches, furniture and packing cases.

Protium altissimum, *March.*—Red Cedar, White Cedar, Cedar.

This tree is a native of British and French Guiana, and Aublet in "Historie des Plantes de la Guiane Francois," i, pp. 342–343 describes it under the name of *Icica altissimum*, saying that it grows about 60 feet high with a trunk 3 to 4 feet in diameter. According to Batterden, "Timber," p. 129, the wood is obtainable in long lengths up to 2 feet square. It is reddish in colour and is used for cabinet making and other purposes. Aublet refers to it as red and white cedar, and Batterden says that the wood is reddish-brown but that there is a variety known as white cedar.

Surinaceae.

Suriana maritima, *L.*—Bay Cedar.

A description of this small tree may be found in Britton's "North American Trees," p. 589, where it is described as growing between

6 and 25 feet in height and as being of bush-like habit with reddish-brown, heavy wood which is not of sufficient bulk to find any use except that of firewood. It is found in Florida, the West Indies and in northern South America.

Bignoniaceae.

Tabebuia pentaphylla, *Hemsl.*—White Cedar.

In "Timbers of Commerce," p. 169, Stone combines these two names, or rather gives *T. pentaphylla* as the white cedar of Bermuda and the Windward Islands. It is also suggested to be the source of West Indian boxwood, although there is still some doubt as to exact identity of that wood. The wood is yellowish in colour, fine and close-grained.

Tecoma leucoxylon, *Mart.*—White Cedar.

The wood of this West Indian tree is sometimes used for furniture and other purposes. According to a reference in the "Report on General Administration Record of New Granada," (1911–1912), pp. 13–15, the species is attracting attention for forest planting and is also used for avenues.

Coniferae.

Torreya taxifolia, *Arnott.*—Stinking Cedar.

This is described in Sargent's "Silva of North America," x, pp. 57–58, under the name of *Tumion taxifolium*, Green. It is a small evergreen tree, sometimes attaining a height of 40 feet with a trunk up to 2 feet in diameter, found in a restricted area in western Florida. The common name originated on account of the wood resembling in appearance other woods which are known as cedars and by the leaves giving off a foetid odour when bruised. The heart-wood is described as being of a clear, bright yellowish colour with lighter sapwood. A specimen in Museum No. III, at Kew, however, has a brownish tinge. Although not in general use, Sargent says that it is hard, strong, rather brittle, has a satiny surface and polishes well. He adds that it is used locally for fence posts on account of its durability when in contact with the soil.

Torreya californica, *Torr.*—Stinking Cedar, Coast Nutmeg, California False Nutmeg.

In "North American Trees," Britton refers to this on p. 127 as stinking cedar, in addition to *T. taxifolia*. It forms a small tree 35 feet or so high with a trunk 2 to 3 feet in diameter. The wood is very like that of the other species and is used for similar purposes.

Libocedrus decurrens, *Torr.*—Red Cedar, White Cedar, Bastard Cedar, Post Cedar, Incense Cedar, Californian White Cedar, Western White Cedar.

Hough, in "American Woods," vi, No. 141, p. 44, records this tree as being a native of the coastal regions of Oregon and California ascending the mountains of S. California to an elevation of 8,500 feet. Under the most favourable conditions it attains a height of 100 to 150 feet with a diameter of 6 or 7 feet, its outline being stiff and columnar. This latter feature is very noticeable in ornamental specimens in this country. Hough describes the wood as very light, soft, brittle, close-grained, compact, odorous, durable in contact with

the soil and with dark-coloured bands of summer cells. The heart-wood is reddish-brown and the sapwood yellowish. It is used for the interior finish of houses, shingles, and fencing, whilst Jepson, "The Silva of California," pp. 148–149, refers to its use for telegraph and telephone poles.

Libocedrus Bidwillii, *Hook. f.*—New Zealand Cedar, Pahautea.

Two species of *Libocedrus* are indigenous to New Zealand, the one under notice and *L. Doniana*, Endl. Of the two *L. Bidwillii* only appears to be known as cedar, although the wood of both trees seems to be put to similar uses. T. F. Cheeseman describes both trees in his "Manual of the New Zealand Flora," pp. 646–647, and he says there that *L. Bidwillii* is the smaller tree, rarely growing more than 50 feet high with a trunk diameter of 1½ to 3 feet. It is found in both the North and South Islands at elevations varying from 800 to 4,000 feet. The wood is described as soft, red, straight in the grain, easily split and apparently of great durability but of low specific gravity and somewhat brittle. An example may be seen in Museum No. III, at Kew, which was obtained from the Melbourne International Exhibition of 1880.

Cupressus Lawsoniana, *A. Murr.*—Port Orford Cedar, Cedar, White Cedar, Oregon Cedar, Lawson Cypress, Matchwood.

Reference was made to this tree in *K.B.*, 1912, p. 78. It is a native of Oregon and northern California and under the most favourable conditions attains a height of 200 feet with a diameter of from 6 to 12 feet. The wood is light yellow in colour, fragrant, and is an esteemed and valuable wood for the interior finish of houses, boat-building, railway sleepers, fence posts and match making.

Cupressus nootkatensis, *Lamb.*—Yellow Cedar, Yellow Cypress.

This is another important wood from Western North America. It occurs from southern Alaska to Oregon, and sometimes attains a height of 100 feet with a diameter of 5 or 6 feet. The wood is light but moderately hard, close-grained, fragrant, and yellowish in colour. It is used for cabinet-making and for various other purposes. For further particulars see *K.B.*, 1912, p. 79.

Thuya plicata, *D. Don.*—Western White Cedar, Canadian Red Cedar, Red Cedar, Canoe Cedar, Yellow Cedar, North Western Red Cedar, Oregon Cedar.

Amongst Western North American Conifers this is an important one from a commercial standpoint, for not only is considerable use made of its wood in its native country, but it has proved itself amenable to cultivation in various foreign countries and is looked upon as a likely forest tree in different parts of Europe, including the British Isles. It is found in Alaska, British Columbia, Oregon, Washington and Northern California, where it is met with from a moderate-sized tree 50 to 70 feet high with a trunk 3 feet or so in diameter, to giant specimens 200 to 250 feet high with a trunk diameter of 18 feet. Jepson, in "The Silva of California," pp. 150–151, refers to it as a tree growing from 150 to 225 feet high with a trunk 16 or 18 feet in diameter near the ground. The head is usually narrow and the tree may be readily distinguished from *T. occidentalis* by its more vigorous habit and darker leaves. The

sapwood is yellowish in colour and the heart-wood reddish brown. Both are fragrant, easy to work, and light; the heart-wood in particular is very durable and stands exposure well. Its principal use is for shingle making, but it is also widely employed as a general building wood, particularly for doors and window frames, also for posts and rails, barrels and boxes.

Hough, "American Woods," ix, No. 220, p. 45, in referring to its durability and use for shingles, instances a case of a tree which had fallen in the forest and upon the trunk of which another tree showing 130 annual rings had grown, being generally sound, and after the removal of the second tree, the wood of the first was used for shingles. He says that in December, 1899, he was informed that in the State of Washington 158 shingle mills were operating and turning out thousands of car loads of shingles annually. The name of canoe cedar arose by reason of the N. American Indians hollowing the trunks out for canoes. The same tribes used the inner bark for weaving into cloth, baskets, blankets, &c.

Cupressus thyoides, *L.*—Cedar, Coast White Cedar, White Cedar.

Writing of this tree in the "Silva of North America," x, p. 91, Prof. Sargent refers to it as one of the most valuable timber trees of North America by reason of its growing in cold swamps where no other timber tree would flourish. Under the best conditions it is found as a tree 70 to 90 feet in height with a trunk 3 to 4 feet in diameter. The timber has a good reputation for durability. It is light coloured, fragrant, works easily, and is used for building purposes &c. Hough, "Elements of Forestry," p. 306, makes the following interesting observations about the wood. "Enormous quantities of this wood are found buried in salt marshes in Southern New Jersey where no timber now grows. In searching for it the marshes are probed with iron rods, and when a tree is found, its size, direction and quality are ascertained. By tearing off a piece of wood, it may be known by the odour, whether it fell from age, or was blown down by the winds. If the latter, it is more valuable, and after cutting away the turf at the top, the wood is sawn off in two places, when it will rise and float away bottom upwards because the lower side is soundest. The wood has all the buoyancy of fresh cedar, not being in the least water-logged and the bark is still fresh. Tree after tree from 200 to 1000 years old may be found lying across one another, some partly decayed as if they had stood a long period after they were dead. The wood is sawn into boards or made into shingles." He quotes from the Forestry Report of 1877 that from $9,000 to $10,000 worth of shingles have been made in a single year from this buried cedar in the vicinity of Dennisville. In the British Isles it is grown as an ornamental tree, and is distinguished by its small, scale-like leaves, small cones and fastigiate habit.

Cedrus Libani, *Loud.*—Cedar of Lebanon.

This, the cedar of the Syrian Mountains and particularly of Mount Lebanon, is by reason of its association with Holy Writ probably the oldest and most widely known cedar. It is probable that many cedars of the present day owe their common names more or less directly, to their wood having an odour somewhat similar to that of this tree. Vague ideas exist regarding the value

of the cedar of Lebanon, and owners of fallen trees in this country usually expect a high price for the timber, whereas it does not find even a low place in the timber market and is classed amongst the poorer kinds which are sold for firewood.

Mature specimens present a very imposing appearance for they may be from 60 to 90 feet high with a trunk girth of 9 to 16 feet, the heads being tabular in outline and composed of a number of massive branches. When grown amongst other trees a considerable length of clean trunk is formed but when grown in the open, branches usually occur fairly low down. Under ordinary conditions in the British Isles, trees attain their normal size at from 100 to 130 years of age, after which growth is very slow. The wood is yellowish-brown and has been recommended for building purposes ; but that produced in this country is coarse and inferior to Scots pine. It is, however, popular for burning on account of its fragrance. The first plants are reported to have been introduced to this country about 1683, and a considerable number of the older trees which now exist are known to have been planted about the middle of the following century. An interesting account of this and other species of *Cedrus* may be found in Vol. iii, of the "Trees of Great Britain and Ireland," by Messrs. Elwes and Henry.

Cedrus atlantica, *Manetti*.—Atlas Cedar.

Botanists are disposed to regard this as a geographical form of *C. Libani* rather than a distinct species, for mature trees growing under natural conditions are said to produce no distinctive characters, although it is not difficult to separate young trees of the two kinds as they are seen growing in this country : the Atlas Cedar being of more rapid growth and the branches having a looser and more pendant habit than those of *C. Libani*. *C. atlantica* is found at an altitude of from 4000 to 7000 feet in the Atlas Mountains, where it forms the principal feature of the arborescent vegetation. It was introduced to English gardens about 70 years ago, is perfectly hardy, grows freely, forms a useful decorative tree, and has been suggested for forest planting ; it remains to be seen, however, whether its timber will be of sufficient value to warrant its use in this country for the latter purpose. In northern Africa its wood is used for building purposes, posts, &c.

Cedrus Deodara, *Loud*.—Deodar, Indian Cedar, Himalayan Cedar.

This tree may be distinguished from both the Atlas and Lebanon cedars by its longer leaves and more leafy branches. It is a native of the Himalaya and is considered to be the most important timber tree of northern India, its wood being in demand for general building purposes, railway sleepers, posts, and other uses. It occurs at elevations varying from 4000 to 10,000 feet and under favourable conditions attains a large size. Trees have been recorded upwards of 200 feet in height with girths of from 30 to 35 feet, although average-sized trees are much smaller. The forests are replenished by natural regeneration and they are the object of much care on the part of the Indian Forest Department. Gamble, "A Manual of Indian Timbers," pp. 710–715, gives an interesting account of the tree under natural conditions, and from his description of the wood the following remarks have been extracted :—"Deodar wood is very

durable ; probably, with cypress, the most durable of the Himalayan woods. Stewart mentions the pillars of the Shah Hamaden mosque at Srinagar, in Kashmir, which date from 1426 A.D., and are now consequently (1901) 475 years old, as having been quite sound at the time he wrote. It resists wet, also white ants, and apparently does not suffer from dry rot."

Juniperus macropoda, *Boiss.*—Himalayan Pencil Cedar.

This species is widely distributed in the Himalaya from Nepal to Afghanistan, where it is found as a moderate-sized tree 40 to 50 feet high with a girth of 6 or 7 feet, although much larger trees have been recorded. As is the case with most other Junipers, it is of slow growth and often forms knotty wood. The timber is described as fragrant and moderately hard, and specimens in Museum No. III, at Kew, show it to have reddish heart-wood and yellowish sapwood. It is said to be used for wall-plates, beams and fuel, but neither Gamble nor Brandis says that it is used for pencil-making, although Gamble, "A Manual of Indian Timbers," p. 698, calls it the Himalayan pencil cedar.

Juniperus communis, *L.*—Ground Cedar, Common Juniper.

Sargent, in the "Silva of North America," x., p. 75, refers to the common juniper as the ground cedar, although it does not appear to be classed as a cedar in Europe. A common species throughout Europe and Northern Asia, it is a familar shrub in many parts of the British Isles. In some parts of the Highlands of Scotland it is the commonest shrub after the heather and ling, whereas in the chalky soil of Hertfordshire and Buckinghamshire it is a familiar bush on commons and sometimes in pasture fields. Its wood is of no value.

Juniperus tetragona, *Schlecht.*—Rock Cedar.

This tree is described by Sargent in the "Silva of North America," x, p. 91, under the name of *J. sabinoides*. It is a native of Mexico and Texas and is said occasionally to attain a height of 40 feet, although its normal height is 20 feet and its diameter one foot. Except for various local uses, such as posts and rails, it does not appear to be of any commercial value.

Juniperus occidentalis, *Hook.*—Western Red Cedar, Yellow Cedar, Canadian Juniper, Californian Juniper.

The several common names here mentioned are referred to by Stone "Timbers of Commerce," p, 257. Sargent "Silva of North America," x, describes the tree as sometimes attaining a height of 40 or 50 feet with a trunk 3 feet in diameter, but it is usually much smaller and sometimes a mere bush a few feet high. It is fairly widely distributed in North Western America from Canada to California. The wood is heavy, close-grained and fragrant but less highly coloured than that of *J. virginiana*. It is said to be used for fencing as it stands exposure well and does not decay readily when in contact with the ground. Generally, it can only be compared with the inferior qualities of *J. virginiana*.

Juniperus mexicana, *Schiede.*—Rock Cedar, Juniper Cedar, Mountain Cedar, Cedar.

In "North American Trees," by Britton, p. 116, this species is described as rock cedar in addition to the other names here

given. A native of Texas and Mexico, it forms forests and dense brakes in the limestone hills ; its maximum height being 90 to 95 feet and its trunk diameter 9 to 18 inches. The wood is described as hard, weak, close-grained and brown. It is used for general construction, fencing, sills, telegraph poles, railroad ties and fuel.

Juniperus pachyphlaea, *Torr.*—Oak-barked Cedar, Thick-Barked Cedar, Mountain Cedar.

The above mentioned common names in addition to various others such as thick-barked juniper, alligator juniper and checkered-barked juniper are applied to this tree by Britton in "North American Trees," p. 113. It grows in the dry parts of Texas, New Mexico, and Arizona, where at its best it attains a height of about 50 feet. The wood is reported as weak, soft and brittle, light red, and close-grained.

Juniperus californica, *Carr.*—White Cedar, Sweet-berried Cedar, Californian Juniper.

This is a small tree or large bush native of California, Arizona, &c. At its best it approaches 40 feet in height with a trunk up to 12 inches or so in diameter. The wood is described as soft, close-grained and light reddish-brown. It is durable and used for fence posts in its native country. The common names quoted above are used by Britton, l.c. p. 109.

Juniperus barbadensis, *L.*—Barbados Cedar, Southern Red Cedar, Red Cedar.

Specimens of the wood of this tree in Museum No. III, at Kew, bear a close resemblance to the wood of *J. virginiana*, and it appears to be used with that wood by pencil makers. It is found in the Southern United States and the West Indies, where it attains a height of about 30 feet. Britton, l.c. p. 119, describes the wood as soft, weak, close-grained, red, fragrant and at one time used largely by pencil makers but now becoming uncommon.

Juniperus bermudiana, *L.*—Bermuda Cedar, Bermuda Red Cedar.

This is a moderate-sized tree native of Bermuda. According to "Garden and Forest," iv, pp. 289–290 it is the most important tree in the island and dominates the other arborescent vegetation. It appears to be able to adapt itself to a variety of conditions, for it occurs on brackish swamp lands and also on dry limestone hills. The larger trees are about 40 feet high with a trunk diameter of 3 to 4 feet. The wood is used for ship-building and the best marked samples for furniture. Cedar chests and cabinets made from the wood are said to be highly prized in Bermuda and to be handed down as heirlooms from generation to generation.

Juniperus virginiana, *L.*—Cedar, Pencil Cedar, Red Cedar, Virginian Cedar.

It would be difficult to overestimate the importance of this tree for no other wood has yet been found to equal it for the manufacture of casings for lead pencils. The species has a very wide distribution in North America, and according to Hough, "Elements of Forestry," p. 308, "it extends from about latitude 45° in Canada,

to the Gulf States, and from the Atlantic to the mountains that border the Pacific States. Between the Sierras and the Wahsatch Mountains it occurs at an elevation of from 5000 to 7000 feet above sea level, and is there a small tree, usually not over a dozen feet high and of low, compact form." Under the most favourable conditions however, it has been met with 120 feet high with a diameter of 3 feet (see "Forest Planting Leaflet," Circular 73, U.S. Dept. of Agriculture). Timber suitable for cutting is apparently becoming scarce in some localities and the comparative shortage of easily available timber has been alluded to several times of late in trade journals. A note occured in the "Timber News" for Feb. 1st. of the present year, p. 4, to the effect that the supply of wood suitable for pencil stock is so reduced that in Tennessee the pencil factories buy logs from old cedar barns, and fence rails, in some cases paying as high as 10 cents a rail, in addition to putting up a new wire fence. *Juniperus virginiana* grows in a great variety of soils but is said to thrive most satisfactorily in America in light, loamy soil containing lime. It grows quite well in this country, but probably develops too slowly to warrant its inclusion amongst forest trees. The wood is reddish and fragrant, and between the knots it is straight-grained. An experimental plantation has been made at Avondale, in Ireland.

Juniperus procera, *Hochst.*—East African Cedar.

Some notice has been taken of this tree of late as a likely substitute for the wood of *J. virginiana* for pencil making, and an account of the timber as received in Liverpool from Usambara, German East Africa, is to be found in *K.B.*, No. 2., 1913, p. 82. The wood is described as having a fine, straight and almost even grain, a beautiful dark-red colour, an even texture, a fragrant cedar-like odour, and as being brittle, non-resinous, of light weight and nearly as soft as red cedar.

Callitris arborea, *Schrad.* — Clanwilliam Cedar, Cedarboom. *Widdringtonia juniperoides*, Endl.

T. R. Sim, in "The Forests and Forest Flora of Cape Colony," pp, 338–340, describes this tree as occurring singly or in small clumps over an area 30 miles in length in the Cedarberg Range; the lowest altitude at which the species occurs being given as about 3425 feet and the highest as 4800 feet, a region where the climate is characterised by being very hot and dry in summer and cold and wet in winter. It is only known to grow wild in the one district, and with reference to this Sim says "the curious distribution of this tree, confined as it is to one range of mountains far away from all other forest areas and related only to its few congeners in S. Africa, to another large tree in Central Africa, and to others in Madagascar, Australia, and New Caledonia, gives it a unique position in respect to its relation to other parts of the Cape Flora. These African species are evidently the last remains of a vegetation which it is only reasonable to believe included at some far remote period a more connected and much larger area than it does now." Fifty or sixty years ago the tree was more plentiful than at present and larger trees existed. The forests have, however, been depleted by lumber-men and by fires. Formerly trees were known

which measured 60 to 70 feet in height and 12 to 18 feet in girth ; but the best trees of the present day are much smaller. The timber is very inflammable, yellowish in colour, easy to work, fragrant and useful for the general woodwork of houses, furniture, posts, &c. It is considered to be one of the best native woods of S. Africa and the species is being planted by the Forestry Department of the Union of S. Africa.

Athrotaxis selaginoides, *D. Don.*—Cedar of Tasmania, King William Pine.

A specimen of the wood of this tree which was obtained from the International Exhibition of 1862 is to be seen in Museum No. III. at Kew. The species is known in this country as a rare decorative bush, its culture being restricted to the milder parts of the country. A detailed description with numerous figures of the plant, including one of trees growing under natural conditions, may be seen in the "Pines of Australia," by R. T. Baker and H. G. Smith, pp. 303–312, its common name being given there as King William Pine. It is represented as a gaunt tree up to 100 feet high and 3 feet in diameter, common in the neighbourhood of Williamsford, Tasmania. The following particulars are extracted from the above-mentioned work. Under normal conditions the tree is a prominent feature amongst the scrub vegetation peculiar to the region in which it grows but is not a handsome tree, as it is of irregular outline with comparatively few branches which are usually confined to a small dense crown, the trunk often being bare for three quarters of its length. The wood is pale red when freshly cut but lightens on exposure. It is open and straight in grain, light in weight, easy to work and not unlike American redwood both in character and texture. It is in good repute for durability in Tasmania and is suitable for cabinet work, and coach building, whilst it is also said to make good oars and sculls. A peculiarity is mentioned regarding the leaves, for when they fall to the ground they remain green for upwards of 18 months.

Podocarpus elata, *R. Br.*—Pencil Cedar.

Maiden refers to this tree as pencil cedar in "Australian Native Plants," pp. 589–590. It is a native of New South Wales and Queensland and at its best attains a height of 100 feet with a trunk diameter of from 2 to 3 feet. The wood is described in the above mentioned work as being free from knots, soft, close, easily worked, good for joinery and cabinet work, and as sometimes affording beautifully-marked planks. Fine specimens are said to have a mottled appearance of surpassing beauty. It is further stated to be fine in grain, lasting and not readily attacked by white ants or teredo.

Pinus glabra, *Walt.*—Cedar Pine, Spruce Pine.

Britton, in "North American Trees," p. 43, gives this combination of names. The species is found in the South-eastern States from South Carolina to Florida and Louisiana, where it occurs as a tree up to 45 feet high with a trunk 3 feet in diameter. The wood is described as weak, soft, brittle, very close grained and of little value.

Pinus inops, *Soland.*—Cedar Pine, Jersey Pine.

This is referred to in the same work as the last-named species. Although often a small, scrubby tree, it sometimes grows 40 feet high with a trunk 2 to 3 feet in diameter. The wood is not of much value but is described as durable and used to some extent for pumps, water tubes and fuel. It is found in poor rocky soil from New York to Indiana.

Widdringtonia Whytei, *Rendle.*—Milanji Cedar.

An account of this coniferous tree, found by Mr. Whyte growing on Mount Milanji, British Central Africa, is to be found in *K.B.* 1892, pp. 122–123. It is the most prominent tree in the forests and specimens 140 feet high with trunks 5½ feet in diameter at 6 feet from the ground, with straight clean stems 90 feet long, have been recorded. Specimens of the wood in Museum No. III at Kew, are of a pale reddish colour and the wood appears to be of good quality and easily worked. It is, however, unknown commercially; difficulties attending its extraction and transit preventing its becoming a commercial timber, although it is used locally for building purposes. It is also doubtful whether the tree exists in sufficient quantities to make its timber of any considerable importance even were it within a short distance of the sea. Efforts are being made to form new forests in its native country, but there are few places in the British Isles where the tree would be likely to succeed out of doors.

XXXVI.—LAELIA CAULESCENS.

R. A. Rolfe.

There is a group of small-flowered Brazilian Laelias whose history is in much confusion, chiefly on account of the paucity of material on which the species were based and the subsequent difficulty of identifying them. One of these is *Laelia caulescens*, Lindl. (originally described from the Herbarium of Martius), the type specimen of which is preserved in the Herbarium of the Kgl. Botanischen Museum at Munich. Owing to the uncertainty about this plant, application was made to Prof. Dr. L. Radlkofer for the loan of the original specimens, and it may be interesting to put on record the results of comparison with the allied species.

Laelia caulescens, Lindl., was described in 1841 (Bot. Reg. xxvii. sub t. 1), from materials collected by Martius in the Serra de Piedade, Prov. Minas Geraes, Brazil. It was said to be very near *L. cinnabarina*, Batem., but with the flowers apparently purple, and the lip perfectly destitute of all elevations or inequalities. A year later Lindley considered *L. caulescens* to be synonymous with his *L. flava*, described three years previously (Bot. Reg. xxv. Misc. p. 88) and then thought to be native of Mexico. He added that he had also a fine specimen collected by Gardner in elevated rocky places in the Serra do Frio in the Diamond District of Brazil (Bot. Reg. xxviii. t. 62). The identification of *L. caulescens* with *L. flava* is only correct so far as Gardner's specimen is concerned.

When Lindley originally described *Laelia caulescens* he remarked: "In the herbarium of von Martius is a similar plant from the same locality, with a three-flowered raceme and much shorter leaves; apparently it is a mere variety." Reichenbach referred this plant doubtfully to his *Bletia rupestris* (Xen. Orch. ii. p. 59), which is a synonym of *Laelia rupestris*, Lindl., and in a note under *Bletia caulescens* (p 60) he specially alludes to a specimen of it at Munich, on which Lindley had written "*Laelia caulescentis var.*? *an species diversa*?" This specimen he has definitely labelled "*Bletia rupestris*, Rchb. fil.," but it is certainly not *Laelia rupestris*, Lindl., which is a taller, more robust plant, with larger flowers. The same specimen Prof. Cogniaux has referred to *Laelia longipes*, Reichb. f., and I believe correctly, for it has the dwarf habit and floral structure of that species, while Martius has definitely recorded the colour of the flowers as "purpureo-violaceis." The original of *Laelia longipes*, Reichb. f. (*Bletia longipes*, Reichb. f., Xen. Orch. ii. p, 59), came from Brazil (Sellow, 1413) and is preserved at Berlin. There is a similar specimen in Lindley's Herbarium labelled "*Laelia caulescens*, Lindl., Brasilia, Sellow," but without any number, the name being written by the distributor, and apparently accepted by Lindley as correct. It, however, agrees only with the shorter-leaved plant alluded to by him.

The true *Laelia rupestris*, Lindl., is a quite distinct species, which was collected by Gardner in rocky plains in the Diamond District, Prov. Minas Geraes, Brazil, in 1840, and described two years later (Bot. Reg. xxviii. sub. t. 62). It closely resembles *L. flava*, Lindl., in habit, but has violet-purple flowers. We have seen that a specimen of Martius referred here by Reichenbach belongs to *Laelia longipes*, Reichb. f., but he also confused it to some extent with *Bletia caulescens*, Reichb. f., for in a note under the latter (Xen. Orch. ii. p. 60), he remarks that a plant which was cultivated by Makoy in 1885, under the name of *Brassavola violacea*, agrees exactly with the *Laelia rupestris* delineated in Lindley's Herbarium. Now this figure is a coloured drawing of the lip of a flower that was sent to Lindley from the Trinity College Botanic Garden, by J. T. Mackay, in May, 1845, and is believed to have been from a plant collected by Gardner.

This leaves *Laelia caulescens*, Lindl., as a distinct species, as it was also regarded by Reichenbach, who, however, failed to clear up its history. Cogniaux also (Mart. Fl. Bras. iii. pt. v. p. 281, t. 65, fig. 2) considers *L. caulescens*, Lindl., to be distinct, and adds the localities Sierra de Lapa, Riedel, 99, and S. E. Brazil, Sellow, 910. The former I have not seen, but there is an unnumbered specimen collected by Sellow, and sent from Berlin to Sir William Hooker, which I suspect to be identical with the latter. The one other specimen preserved at Kew is Glaziou, 17,271, collected in the province of Minas Geraes. Besides the confusion already pointed out, there is a note (Xen. Orch. ii. p. 60) that Gardner 5197, 5198 apparently belonged to *Bletia caulescens*, which is clearly erroneous. It is probable that 5198, 5199 were intended, but the former is *Laelia flava*, Lindl. and the latter *L. rupestris*, Lindl. Reichenbach also added a *Bletia caulescens*, var. *Libonis* (Reichb. f. Xen. Orch.

ii. p. 60), based on a specimen collected in the Province of Minas Geraes, Brazil, by Libon. I have not seen it, though from the two-leaved pseudobulbs and other characters I believe a plant collected by Dr. Stephen and preserved at Kew to be identical. The locality is given as "Sao Joao d'El Rey, 3500–5500 ft., Prov. Minas Geraes." The colour is not recorded, but the flowers appear to have been purple in the living state.

It is quite clear that *Laelia caulescens*, Lindl., is distinct from *L. flava*, Lindl., but the history of the former is still imperfect. The original specimen is taller than those subsequently collected, being over two feet high, with the leaf five inches long and the scape bearing as many as twelve flowers. There is no note of their colour. Lindley's remark that the lip is destitute of elevations is erroneous, as was pointed out by Reichenbach. There are other Brazilian species from the same region with small flowers and a much crisped lip, but none that appear to have been confused with *L. caulescens*. It would be interesting if someone would re-collect these plants, paying particular attention to the conditions under which they grow and the colour of the flowers.

XXXVII.—PARA RUBBER.

(*Hevea brasiliensis.*)

The following correspondence relating to the variety of *Hevea brasiliensis* planted in the Orient has passed between the Director of Agriculture, Federated Malay States, and the Director of the Royal Botanic Gardens, Kew :—

Kuala Lumpur,
1st April, 1913.

Sir,

In a report by the Brazilian Commission on the Rubber Industry the statement is made that the rubber planted in the Orient is almost entirely from seed of a "white" variety of *Hevea brasiliensis* (?), which like the "red" variety produces weak rubber, while the best rubber is produced by a so-called "black" variety, this growing on higher and drier land than the others.

It does not seem at all probable that the statement is correct, but I should be greatly obliged if you could give me any information from the botanical side which would tend either to support or discredit a statement which is calculated to cause a certain amount of uneasiness among those interested in Eastern plantation rubber.

I am, &c.,

L. Lewton Brain,
Director of Agriculture.

Royal Botanic Gardens, Kew,
April 30th, 1913.

SIR,

I HAVE the honour to acknowledge receipt of your letter No. 382/1913, dated 1st April, 1913, on the subject of two statements made by a Brazilian Commission on the Rubber Industry, viz. :—

(*a*) that the rubber planted in the Orient is almost certainly from seed of a "white" variety of *Hevea brasiliensis* ;

(*b*) that this variety of *Hevea brasiliensis* produces a weak rubber.

2. It is to be presumed that whether it was or was not the intention of the parties making this statement to cause a certain amount of uneasiness among those interested in Eastern plantation rubber it would not be unpleasing to those interested in Brazilian rubber if the statement were correct.

3. You enquire whether there is any information from the botanical side which would tend either to support or discredit these two statements.

4. In reply I have to observe that a feature of difficulty is imparted to the question by the use in the report of the Brazilian Commission of the term variety without any opportunity of learning what significance is to be attached to the term. If the Commission has employed this term in a scientific sense we are without any clue as to what characters have been relied upon by the Commission in distinguishing the three varieties they mention from each other. It is further to be noted that the Commission does not discriminate a "typical" variety, nor do they, as an alternative to this omission, state which of the three varieties *white*, *red* or *black* they would treat as typical *Hevea brasiliensis*. Their treatment of the question, however, is such as to lead to the conjecture that "variety" is employed in their report in a colloquial, as opposed to a scientific, sense and that the *white*, *red* and *black* varieties mentioned by you are in fact the "seringueira branca," "seringueira vermelha" and "seringueira preta" respectively of Brazilian travellers.

5. Assuming this to be the case we are informed (see Dr. J. Huber, in Bol. Mus. Goeldi, vol. iv. p. 639), that the *white* and *black* "seringueiras" are botanically scarcely separable from typical *Hevea brasiliensis* while the *red* "seringueira" represents the scientific variety of *H. brasiliensis* distinguished by Huber as var. *stylosa*. However, according to Dr. Ule, there are *two red* "seringueiras." One of these is *Hevea brasiliensis* var. *stylosa*, Huber, and the other is *Hevea cuneata*, Huber ; the latter is the Itaubé of Brazil. Dr. Reintgen (in Tropenpfl. vol. vi. Beih. no. 2 [1905], p. 105) has stated that the *red* variety, or Itaubé, is the most important and best known economically ; Dr. Huber on the other hand declares that Itaubé yields a product of less value than the *white* or the *black* "seringueira." This latter discrepancy may indeed owe its existence to the circumstance that there are, as Ule points out, two quite distinct *red* "seringueiras" and that while Huber had one, Reintgen may have had the other in view.

6. However this may be it is clear that the scientific botanists who are at work in Brazil have not yet been able to come to a

common understanding as to the relative economic value and status of the three sorts of "seringueira" spoken of in your letter as *red*, *black* and *white* varieties. But the evidence, such as it is, points to only the *red* as being distinguishable botanically from typical *H. brasiliensis*. The *black* and the *white*, so far as the available evidence goes are not varieties in a scientific sense; they appear only to be different states of the same type, the particular state which is of most value being that which grows on higher and drier land than the other.

This last statement of the Commission thus qualified is in complete accordance with what has always been understood with regard to *Hevea brasiliensis* and we have no reason to doubt the strict accuracy of the statement (see Wickham, Para Rubber, pp. 5 and 61), that the whole of the *Hevea* seed originally introduced to the East came from trees which grew under the conditions thus indicated by the Brazilian Commission.

I am, &c.,

D. Prain.

Kuala Lumpur,
27th May, 1913.

Sir,

I have the honour to thank you for your letter dated April 30th, with reference to the varieties of *Hevea brasiliensis*, and for your clear explanation of the question.

Perhaps the attached letter from Dr. C. J. J. van Hall with reference to the trees at Pasir Oetjing (which were said to be the only ones in the East belonging to the "black" variety) may interest you.

I am, &c.,

L. Lewton Brain.

Buitenzorg, den 16, Mei, 1913.

Dear Mr. Lewton Brain,

The result of the investigation at Pasir Oetjing about the "black variety" is as folllows :—

All the Hevea-trees at this plantation originate from seeds from the F.M.S. (Valombrosa, &c.) except the oldest ones, planted 8 years ago. No difference is to be seen between the first mentioned trees and the Hevea-trees on other plantations in Java. As regards the 8 years old trees, these are about 1500 in number, they have been bought from Godefroy-Lebeuf (Paris), who got the seeds from Brasil.

Dr. Rutgers went to Pasir Oetjing to investigate these Heveas. Their appearance is a little different from that of the common type, the bark of all being very smooth and more greyish or whitish; the bark is thin. The yield is poor and decidedly below the average. In the leaves there is as much variation as always among Hevea-trees and nothing particular could be found.

It thus turns out that a number of trees could be found at Pasir Oetjing, which had another origin than the common type in Java and the appearance of which was slightly different, while the yield was poor. If a name ought to be given to this "variety" we must call it "white," not "black."

Yours very truly,

VAN HALL.

Kuala Lumpur,
29th May, 1913.

SIR,

WITH reference to my letter of the 27th instant, Dr. van Hall informs me that the Pasir Oetjing trees are 13 years not 8 years old.

I am, &c.,

L. LEWTON BRAIN.

XXXVIII.—VARIETIES OF PLANTAINS AND BANANAS CULTIVATED IN SEYCHELLES.

The following account of the varieties of Plantains and Bananas cultivated in the Seychelles has been received from Mr. P. R. DUPONT, Curator of the Botanic Station, Seychelles:—

There are so many Africans among the labouring classes of the community that banana cultivation has spread all over the Archipelago; and in many localities, banana eaters, as the Africans are sometimes called, have developed the culture of this plant to such an extent, that one can say that it ranks in production next to the coconut in Seychelles.

The following are the varieties generally cultivated:

1. The Chinese banana (*Musa Cavendishii*) called locally "banane gabou," which is eaten raw. It is planted in depressions of ground where moisture accumulates, and will not stand stiff laterite soil. It is attacked by the weevil (*Sphenophorus striatus*). This is the only type of dwarf banana planted in Seychelles. Among the tall plantains (so called), there are several varieties which are eaten raw in the ripe state, although most of them are eaten cooked when unripe. The three following varieties are never eaten raw; and, when prepared in coconut milk, are considered a delicacy even by Europeans and other residents.
2. Banane Malgache.
3. Banane St. Jacques.
4. Banane Simeroë.

These three varieties belong to the Congo type, and two of them were cultivated two years ago for the production of banana flour.

Nos. 3 and 4 are different from No. 2 which always possesses the terminal bud of unopened flowers and bracts at the end of the fruit stalk. This is the best of the type. Nos. 3 and 4, Banane St. Jacques and Simeroë are very nearly allied species and are distinguished from No. 2. principally by the absence of the terminal

"bud." The hands are fewer in number than in Banane Malgache, and many planters are of opinion that the number of "fingers" serves to distinguish between "Simeroë" and "St. Jacques," the former being a degenerated type of the latter, and the whole bunch being replaced by one or two enormous fingers. These three plantains possess a tall pseudo-stem with reddish blotches along the petioles and the upper part of the stem. This colouring of the stem and petioles is exactly the same in the three varieties, and is more or less pronounced according to exposure to the sun. The three plantains in question are badly attacked by the weevil, and are mostly cultivated in rich ground, being more exacting than the other more common varieties.

5. There is another plantain of the Congo type called locally Banane "Barbare" which is eaten raw. Its fingers are sometimes quite as long as those of Banane Malgache or St. Jacques, but the stem possesses blackish blotches, and the leaves are generally broader and longer than in the other two types. This plantain is also attacked by the weevil.

The other bananas are generally eaten raw, except when unripe, and when no other cheap food, such as cassava, &c., is available.

6. Banane "Mille."—This is a tall plantain of the Malay type which is very hardy and not attacked by the weevil. The pseudo-stem possesses blackish blotches, and the bunch is very long with large numbers of short fingers; hence its name. The bunch is sometimes double or treble, and for this reason it earns the name of "elephant's trunk" banana. But this is a case of teratology which has been described elsewhere as well. The fingers develope near the stem end of the stalk, then a few flowers remain sterile, and after a time other flowers develope into a secondary bunch along the same stalk. This variety is very often planted and the fruits exported, as even in the young stage of growth the bunches keep a long time and turn yellow.

7. Banane "Mignonne"—This is a delicious small banana which is said to have been introduced from Reunion Island. The plant is tall, and the pseudo-stem is coloured brown. The fingers are small, but the flesh is hard and highly flavoured. It is a favourite on the table together with the two following varieties.

8. Banane "Tahiti"—A very small banana which is delicious and considered best for the table. It was introduced from Mauritius. The plant is intermediate between plantains and dwarf bananas, and the stem is slender like all the other parts of the plant; pseudo-stem brownish.

9. Banane "Gingeli" or "Figue"—Introduced also from Reunion or Mauritius. A delicious fruit, and much bigger than the other two varieties. Its culture is however limited owing to the attacks of weevils. The pseudo-stem is reddish, nearly of the same colour as those of the Congo type.

10. Banane "Carré"—The fruits of this variety possess four pronounced ridges—hence its name. They are loosely clustered on the bunch and generally eaten cooked. They produce a good yellow-coloured starch on being dried. The pseudo-stem is light green in colour, with green blotches on the lower part of the petioles.

11. Banane "Quatre vingt" or "Galega" or "Australie" or "Duperrel"—said to have been introduced by Mr. Duperrel from Australia. It is a very hardy plantain, but the fruits are of small size and of about the same shape as banane carré. Like the latter, it is immune from the weevil and for this reason occupies a more important place than it deserves. Its fruit is quite inferior. It is nearly allied to banane carré as far as characters of colouring of the stem and petioles are concerned.

12. Banane "Rouge"—The name is derived from the beautiful red colour of the fruits which are eaten raw or cooked and generally appreciated. The stem is also deeply red coloured, and for this reason the plant is ornamental.

13. Banane "Monsieur"—This is a variety certainly derived from the latter, the stem and fruit being the same size and shape, and various shades of colouring showing clearly the derivation of the one type from the other. Sometimes several hands are still coloured red, and the others are green, and the same may be said of some parts of the stem.

14. Banane "Blanche"—This is one of the two types which stand the cool climate of the summits, the other is:

15. Banane "Noire"—The one variety is derived from the other, just in the same way as banane Monsieur is derived from banane Rouge. Banane noire possesses a deep colouring in black of the stem and leaves, and the colour of banane blanche is lighter, but of the same blackish tinge. The same blackish colouring is sometimes found in banane barbare, and it seems that incidental variations in colour are very often due to the climate of this Colony.

Banane mille, noire, blanche, carré, quatrevingt, rouge, monsieur, are immune from the weevil, but I have noticed in a few of these varieties signs of a fungoid or bacterial disease which discolours in red the internal tissues of the pseudo-stem and causes the death of the plants. This disease was known long ago, and is propagating very slowly.

There are only one or two specimens of banane "graîne" (a tall plantain which produces fruits containing seeds) newly introduced.

XXXIX.—SISAL HEMP IN FIJI.

In the *Kew Bulletin* for February 1892, p. 37, it is recorded that at the request of the Governor, Sir John Thurston, plants of the various species of *Agave* yielding fibre were forwarded for cultivation to the Botanic Station at Suva, Fiji. Notwithstanding the long period necessary for the transit of the plants, via Sydney, they arrived in good condition and were subsequently reported to have made satisfactory growth.

Since then there has been a great development of the cultivation of Sisal which has been rewarded with success. The following particulars giving the history of the establishment of the Industry in Fiji are gathered from Bulletin No. I. 1911, of the Department of Agiculture by Mr. C. H. Knowles, Superintendent of Agriculture. Since the establishment of the Department in 1907 Sisal Hemp has been cultivated at the Experimental Stations at Nasinu near

Suva and at Lautoka on the north west coast of Viti Levu, the supply of suckers and pole-plants necessary to form the experimental plots having been obtained from the local Botanic Gardens and in addition a small number of pole-plants was obtained from Honolulu.

At the Nasinu Station the surrounding country is generally hilly and the particular block upon which the Sisal plants were set out consists of a low hill with a red soil described as a heavy loam about one foot deep, the subsoil containing more clay to a depth of about ten feet and well-drained naturally.

The plants were put out in rows eight feet apart, the same distance being allowed between the plants in the rows.

In March 1910 a hurricane did considerable damage to the crop and so far as could be estimated some 40 to 45 per cent. of the leaves were rendered useless for fibre production, but fortunately the damage only affected the crop for that particular year.

The first cutting took place in October 1910 and it was calculated that with 681 plants to the acre the yield of fibre would amount to 1228lbs. According to the Report of the Department of Agriculture for 1911 published in 1912 the total yield of Sisal from the plot was 2499 lbs. to the acre for the two cuttings in March June and December. The percentage of fibre tends to increase with the age of the plants, the first cutting gave 3·25 per cent., the second 3·76 per cent. and the third cutting 4·24 per cent., similar results were obtained at Lautoka. The average rainfall at Nasinu for the five years ending 1911 was 130·49 inches per annum.

At the Lautoka Station which is situated within the "dry zone" the average rainfall for the same period as that given above was 71·66 per annum. At this Station the method of planting was the same as that adopted at Nasinu. An experimental plot, previously ploughed, was planted in June 1907. This plot was situated on the slopes of a low hill with dark chocolate-coloured soil, eight to ten inches deep and lying on partially disintegrated sandstone and well-drained naturally. In April 1910 six rows of Hemp plants were considered fit to cut, the plants then being two years and ten months old. It was decided to cut one row at a time, allowing intervals between the treatment of the different rows to determine the improvement with age. The following table shows the figures actually obtained. :—

Row.		Date of Cutting.	Leaves.		Weight of Fibre.	Weight of Tow.
No.	No. of Plants.		Number.	Weight.		
		1910.		lbs.	lbs.	lbs.
1	32	April 23	1,423	1,984	46	15
2	31	May 2	1,403	1,864	49	16
3	31	Oct. 20	Not counted	2,367	66	18
4	31	Nov. 4	Not counted	3,180	75	
		1911.				
5	32	Jan. 18.	Not counted	2,607	69·5	19
6*a*	32	Jan. 24.	1,926	3,289	87	
6*b*	32	Jan. 24.	443	961	27	

In the first cutting all the leaves were removed up to an angle of 45° and all those under 3 feet long were discarded. The hurricane in March was not severely felt in the Lautoka district and the Sisal-hemp plants suffered no injury.

In row 6 the line of figures marked (*a*) refers to the leaves cut up to an angle of 45°, but it is desired to test the effect of systematic severe cutting and further leaves were removed leaving only eight on each plant besides the central spike. The extra leaves so removed are referred to in line marked (*b*).

Other figures are given in the Bulletin but from the foregoing it will be seen that Sisal plants flourish in Fiji under dissimilar conditions.

In a communication recently received from the Colonial Office it is of interest to find that the industry appears to be on a sound footing and that during the present year 10 tons of the fibre have already been exported.

XL.—MISCELLANEOUS NOTES.

Mr. Philip Valentine Osborne, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, a probationer gardener for service in India.

Nicholas Holtze.—It is with great regret that we have to record the death of Mr. Nicholas Holtze, Curator of the Experimental Garden, Port Darwin, Northern Territory, South Australia.

Mr. Holtze had filled several important Government posts and had earned the reputation of being a thoroughly competent and conscientious public official. He was moreover a man of tireless energy and an ardent and capable botanist.

He was particularly helpful to settlers and was always ready to further their interests by advice. In this connection his researches into the suitability of the country for the growth of rice, sisal, rubber, cocoanuts, sugar, &c., were of particular value, and this side of his work is emphasised in his Reports to Government.

Mr. Holtze was born in Russia in 1868 and came to Australia with his parents when he was five years old. When his father (Dr. Maurice Holtze) was appointed to succeed the late Mr. Schomburgh as Director of the Botanic Gardens at Adelaide in 1891, Nicholas Holtze was placed in charge of the Government Gardens in the Northern Territory in succession to his father.

He was taken ill during a botanical expedition to the Katherine river and though able to be brought back to Darwin he never rallied and died on May 26.

Crataego-mespilus Dardari.—In the *Kew Bulletin*, 1911, p. 267, an illustrated account of this graft hybrid and its companion of similar origin, *C.-m. D'Asnieresii*, was given. They both originated at Bronvaux, near Metz, from shoots borne on a tree of common medlar grafted on hawthorn. Of the two, the latter is the more beautiful as a garden tree, but *C.-m. Dardari* is the more interesting in having (like *Laburnum Adami*) the faculty of producing several types of growth on the same individual. At the time the article

in the *Bulletin* was published, the specimen of *C.-m. Dardari* in the Kew collection carried a branch of pure medlar and one of *C.-m. D'Asnieresii*; but no branch of true hawthorn, the other parent, had appeared, nor has it done so up to the present. Mr. Vicary Gibbs, however, on May 27th. last was kind enough to forward to Kew from his remarkable collection at Aldenham a flowering spray gathered from *C.-m. Dardari*. This spray is *Crataegus monogyna*—the form with hairy flower stalks, calyx-tube and receptacle distinguished by Beck as var. *lanigera*. Mr. Gibbs observes that the flowers, borne on a shoot 3 feet long, were fully open on May 27th., whilst the rest of the tree had only unopened buds of the white, medlar-like blossoms characteristic of *C.-m. Dardari*. A shoot of true medlar has since been found on the tree.

Thus this graft hybrid shows a phenomenon, unique so far as we are aware, of one kind of tree (not as yet, however, one individual) producing four types of growth, two of which are distinct species and two of a hybrid or intermediate nature. They may be tabulated as follows:

1. *Crataegus monogyna* } parent species.
2. *Mespilus germanica* }
3. *Crataego-mespilus D'Asnieresii*, hybrid approaching No. 1.
4. „ „ *Dardari* „ „ No. 2.

Laburnum Adami has not been known to produce more than one hybrid type of flower besides those of its two parent species (*Laburnum vulgare* and *Cytisus purpureus*) three in all.

Botanical Magazine for May.—The plants figured are *Rhododendron Wightii*, Hook. f. (t. 8492); *Deutzia longifolia*, Franch. (t. 8493); *Strongylodon pseudolucidus*, Craib (t. 8494); *Dendrobium Schuetzei*, Rolfe (t. 8495); and *Saxifraga Stribrnyi*, Velenovský (t. 8496).

Rhododendron Wightii is a Sikkim species with large broadly lanceolate leaves, which are densely covered on the under side with a cinnamon-brown tomentum, and loose heads of straw-yellow flowers spotted with deep red. The material for the figure was obtained from a plant which flowered in the Himalayan House at Kew in April 1911. This plant was raised from a graft procured from a fine specimen which is growing outside in the garden of Miss A. Mangles at Littleworth.

The *Deutzia* is an attractive free-flowering species from Western China, whence it was originally introduced into cultivation by Messrs. J. Veitch & Sons in 1902, and has been distributed under the name of *D. Veitchii*. It is a hardy shrub 3–7 ft. high, with lanceolate serrulate shortly petiolate leaves, and compact inflorescences of more or less rose-coloured flowers nearly an inch across. The figure was prepared from material obtained from one of the plants grown at Kew from seeds received from Professor Sargent of the Arnold Arboretum in 1908.

Strongylodon pseudolucidus is a new leguminous climber for the warm conservatory, and is distinguished from *S. lucidus*, Seem., by its much larger bracts and bracteoles and smaller flowers, which are red and about an inch long. It is a littoral species found in Ceylon, the Andaman Islands, Christmas Island, New Guinea, New Caledonia

and North Australia, and extends westward to Madagascar, whence seeds were sent to Messrs. Charlesworth & Co., of Haywards Heath.

Dendrobium Schuetzei is a handsome species from the Philippines and is allied to *D. Dearei* Reichb. f., from which it differs in its shorter pseudobulbs and much larger flowers with a shorter obtuse mentum. The material for the figure was provided by a plant purchased for Kew from Messrs. F. Sander & Sons who introduced the species, and by photographs supplied by them. A plant flowered for the first time at St. Albans in September 1912.

Saxifraga Stribrnyi, a native of Bulgaria, is a small-growing species most nearly allied to *S. media*, Gouan, from which, however, it may be easily distinguished by its more branched inflorescence and nodding flowers. The plant figured was purchased from Mr. Sundermann, of Lindau, Bavaria.

Botanical Magazine for June.—The plants figured are *Rhododendron Augustinii*, Hemsl. (t. 8497); *Hypericum aureum*, Bartram (t. 8498); *Amelanchier oligocarpa*, Roem. (t. 8499); *Osbeckia stellata*, D. Don (t. 8500); and *Agave Warelliana*, Baker (t. 8501).

Rhododendron Augustinii is one of the numerous species which, during the last few years, have been introduced into cultivation from China, where, it is now known, the genus has its head-quarters. *R. Augustinii*, first discovered by Prof. Augustine Henry, is recorded as having flowered in the garden of Mr. M. L. de Vilmorin at Les Barres in 1904. The Kew plant from which the material for the figure was obtained was procured from Messrs. James Veitch & Sons in 1908, the stock in the Coombe Wood nurseries having been raised from seed collected by Mr. E. H. Wilson. The species has been found in Hupeh and Szechuen, and in cultivation proves to be one of the most hardy and free-flowering of the new Chinese Rhododendrons.

Hypericum aureum is an old garden plant, a native of the South-Eastern United States, and remarkable in forming a distinctly woody stem. It is valuable from the fact that its rather large yellow flowers are produced in August when few woody plants are in bloom.

Amelanchier oligocarpa is the dwarfest species of the genus, and by its dwarfness and its few-flowered inflorescences is easily distinguished from *A. canadensis* under which name it is often found in collections. Being a native of cold swamps and mountain bogs from Labrador southward to the shores of Lake Superior and the northern portion of New York State it is extremely hardy in this country. The material for the figure was obtained from a plant received at Kew from the Arnold Arboretum in 1910.

Osbeckia stellata was in cultivation in England nearly a century ago, and was figured in the Botanical Register in 1822 under this name, while it appeared in some gardens as *O. speciosa*. It is distributed from the North-Western Himalaya to China, and the plants now in cultivation at Kew were raised from Sikkim seeds communicated by Major Gage, Superintendent of the Royal Botanic Garden, Calcutta.

The *Agave* is an attractive Mexican species belonging to the section *Littaea*, and to that group in which the flowers are tubular, with recurved segments. It has been known in gardens for many

years, but it is uncommon. In 1912 it flowered in Lady Hanbury's garden at La Mortola and in the garden of Professor G. Roster at Ottonella in the Island of Elba. The figure was prepared from material obtained from La Mortola.

Botanical Magazine for July.—The plants figured are *Podachaenium eminens*, Baill. (t. 8502); *Sedum pilosum*, Bieb. (t. 8503); *Cunonia capensis*, Linn. (t. 8504); *Crotalaria agatiflora*, Schweinf. (t. 8505); and *Vinca difformis*, Pourr. (t. 8506).

Podachaenium eminens has been in cultivation for over seventy years. It is an interesting monotypic genus from Central America rather closely related to *Verbesina*, Linn., but readily distinguished by its opposite leaves and stipitate achenes with few pappus scales. In its native country, S. Mexico to Costa Rica, it ranges from 3000 to 6500 feet.

The *Sedum* is a charming rosy-pink-flowered biennial and is distinct from allied species in its flower colour. Indeed from its general appearance it might be considered a *Crassula* but this is not borne out by the floral morphology. The plant is a native of the Caucasus where it grows at heights of from 4000–5000 feet above sea level.

Cunonia capensis is a plant formerly to be found in cultivation but now rarely met with. We are indebted to Prof. Dixon for the specimen figured which flowered in the garden of Trinity College, Dublin last year. *Cunonia capensis* is a fairly abundant tree in S. E. Africa where it is known to settlers as Red Alder. All the other species of the genus are natives of New Caledonia.

The subject of the next plate is one of the finest of the African species of *Crotalaria* and is a native of British East Africa and Uganda. The specimen figured was submitted to Kew for identification from Pylewell Park, Lymington, where it was grown for the first time in this country. The flowers resemble those of *C. laburnifolia*, but they are very much larger.

The Periwinkle, *Vinca difformis*, is a native of the Western and Central Mediterranean region where it is to be found in moist and shady places. The specimen figured was sent to Kew by Canon Ellacombe, who has grown it for many years in his garden at Bitton. It is not so hardy as *V. major* or *V. minor* but it is a useful plant for warm localities especially as it flowers through the winter.

Kapok in Tropical Africa.*—Kapok is the wool lining the capsules of various species of *Ceiba* (*Eriodendron*) and *Bombax*. The principal area of production is the Dutch East Indies, and Java in particular. In 1906 the Kapok exported from the Dutch East Indies amounted to 6257 tons (at least 5790 tons being from Java), and in 1911 to 9960 tons. British India yielded about 1000 tons in 1909.

In the last few years a small but steadily increasing amount has come from Tropical Africa, principally from Togo and German East Africa, where extensive plantations are being made. In 1911

* Die Kapok liefernden Baumwollbäume der deutschen Kolonien im tropischen Afrika. E. Ulbrich. (Notizbl. Bot. Gartn. Berlin, vol. vi. 1913, pp. 1–34.)

about $2\frac{2}{3}$ tons (2760 kilograms), mostly of wild Kapok, were exported from Togo, and this amount will increase greatly in the near future when the plantations come into bearing.

By far the greatest amount of Kapok is the produce of the Silk-cotton Tree, *Ceiba pentandra*, Gaertn. (*Eriodendron anfractuosum*, DC.), which is the only species cultivated to any extent, and of which innumerable forms occur in the tropics.

The various kinds of Kapok known from Tropical Africa may be grouped in two categories.

The first group includes those with snow-white, dirty white or grey wool, composed of slender soft and long hairs. The seeds are somewhat pear-shaped and 6–10 mm. in length. The following species yield Kapok of this kind: *Ceiba pentandra*, Gaertner, *Bombax buonopozense*, Beauv., *B. angulicarpum*, Ulbrich, *B. flammeum*, Ulbrich, *B. reflexum*, Sprague, and *B. Buesgenii*, Ulbrich.

The second group is characterised by a yellowish, reddish-brown or dark brown wool composed of more brittle, stiffer and shorter hairs. The seeds are globose or cylindric and 1·2–1·8 cm. in diameter or length. The only two species known are *Bombax rhodognaphalon*, K. Schum., and *B. brevicuspe*, Sprague.

Kapok is used for stuffing cushions, mattresses and lifebelts. For the latter purpose its great buoyancy renders it superior to cork. The reddish brown kind yielded by *Bombax rhodognaphalon* has been used recently in paper-making, and has proved to be suitable for the manufacture of coloured blotting-paper.

The seeds yield an oil suitable for lubrication and soap-making, and the residue after expression of the oil may be utilised as a manure.

Wild Kapok is of little importance for the world's supply on account of the relatively small and uncertain amount of the yield, and the soiling of the wool which is due to the capsules having to be picked from the ground after they have ripened and fallen on account of the great height and spiny nature of the trees.

In the plantations the young Kapok trees (*Ceiba pentandra*) are usually raised from cuttings. Branches as thick as a man's arm are cut off and planted 3–4½ ft. deep in the ground, and stripped of their leaves. They grow quickly and usually give rise to spineless trees, which come into bearing rather earlier than seedlings. When the trees grow too high they are lopped in order to facilitate the collection of the fruits and to give more light to the trees planted in between.

Seedlings are transplanted from the seedbeds after 6–12 months or, preferably, after 18–24 months. The young plants grow rapidly if they are stripped of leaves and lopped at about 1½–2 ft. above the ground. Growth is then very quick, and the trees commence to yield when they are 4–6 years old. Reproduction by seedlings is apt to be unsatisfactory, as the results are much less certain than by cuttings, and spiny forms are apt to occur. The best work on Kapok cultivation is G. F. J. Bley's 'De Kapokcultuur op Java.'

The Kapok plantations do not appear to be affected to any considerable extent by parasitic fungi. They suffer, however, from the attacks of several insects, of which the most harmful are the red bugs, *Dysdercus* spp., which live in the fruits and destroy the wool.

Among other insects which injure the fruits are species of *Earias* and *Helopeltis*. Quantities of the young fruits are destroyed by flying foxes.

The beetle *Batocera hector* bores into the trunks and sometimes kills young trees. When a tree attacked by it is found, the holes should be filled with benzine and stopped with clay.

Great damage is done to the Kapok plantations in Java by various kinds of mistletoe (*Loranthaceae*), but nothing is yet known as to the extent to which the Kapok trees are affected by these parasites in Africa.

Dr. Ulbrich's paper concludes with a systematic account of the African Kapok-yielding species. He distinguishes two main varieties of *Ceiba pentandra*; var. *clausa*, in which the fruits do not open until after they have fallen, and the prickles on the trunk are acute; and var. *dehiscens*, in which the fruits open while still on the tree, and the prickles of the trunk are rather obtuse. Both these varieties have forms with snowy white wool and with grey wool.

T. A. S.

The Solomon Islands Guada Bean.—Under the above heading a somewhat exaggerated note, culled from a New South Wales Agricultural Paper, recently appeared in "The Vegetarian Messenger and Health Review." From the description given of the plant and from several samples of seeds received for determination there is little doubt that the Common Snake Gourd, *Trichosanthes anguina* is the plant in question. This species is a scandent annual with an angled stem, much cultivated in the warmer parts of Asia for its fruit which is universally eaten by the natives in their stews and curries.

According to Duthie and Fuller in "Field and Garden Crops of the North West Provinces and Oudh," this plant in all probability had its origin either in India or in the Indian Archipelago. It has never been found in a wild state, unless it be considered, as has been suggested, to represent the cultivated state of *Trichosanthes cucumerina*, a common plant extending throughout India to North Australia.

The fruit of this vegetable is from 1 to 3 feet long, and of a very handsome appearance. When young they are beautifully striped with white and green, and on ripening change to a brilliant orange. The young fruit is used as a substitute for French beans. When cut into thin strips and boiled, they form a fair imitation of that vegetable. The fruit must be used when very young. If cut when more than 4 inches long they often have a very bitter taste. Under the heading of "A Wonderful Vegetable" seeds of this plant are advertised by a nurseryman of New South Wales at 3*s*. per packet of eight seeds. Models of the fruits are to be seen in Case 57, Museum No. 1.

J.M.H.

The Genus Marah.—When the revision of the genus *Marah* was undertaken (*see K.B.* No. 4, 1913, pp. 145-153) the short paper by Greene entitled "Reconsideration of the genus Marah"—Leaflets vol. ii, pp. 35, 36, 1910—was unfortunately overlooked. We are

indebted to Dr. J. N. Rose for calling our attention to this omission in consequence of which several corrections in the new combinations have to be made.

Kellogg in founding the genus *Marah* in Proc. Calif. Acad. i (1853), 37, considered the word *Marah* to be masculine and he has therefore been followed. Greene, however, has used *Marah* as a feminine word. In the following corrections of the new combinations the specific names are retained in the masculine :—

M. guadalupensis, Dunn, should be *M. guadalupensis*, Greene, Leaflets ii, 1910, 36.

M. Watsoni, Dunn, should be *M. Watsoni*, Greene, l.c.

M. muricatus, Dunn, should be *M. muricatus*, Greene, l.c.

M. oregonus, Howell, should not be altered, see Howell, Flora N. America, i (1897), 239.

M. macrocarpus, Dunn, should be *M. macrocarpus*, Greene, l.c.

M. fabaceus, Dunn, should be *M. fabaceus*, Greene, l.c.

M. gilensis, Dunn, should be *M. gilensis*, Greene, l.c.

M. Rusbyi, Greene, and *M. leptocarpus*, Greene, originally described under *Echinocystis* and *Micrampelis* respectively, but recombined under *Marah* by Greene in his paper, were similarly overlooked.

M. leptocarpus appears to be closely allied to *M. horridus*, Dunn, but specimens have not been seen. Its habitat is the Colorado desert in S.E. California.

M. Rusbyi, Greene (*Echinocystis macrocarpa*, Britton), comes from Bolivia and does not belong to *Marah* which has its southern limit in Lower California. The specimen in the Kew Herbarium received from Britton under the above name appears to be an *Echinopepon*.

S. T. D.

Allium triquetrum as a Vegetable.—In the 'Revue Horticole' of July 1st, 1913 (No. 13), p. 311, Fig. 111, Dr. L. Trabut, Director du Service botanique de l'Algerie, gives an illustrated account of the utilisation of *Allium triquetrum*, L., of which the following note is a translation :—

Allium triquetrum, L., which is very common on the Algerian littoral, especially in the neighbourhood of dwellings and in gardens, is much esteemed by the Kabyles who make use of it in large quantities during the winter.

This Allium is called 'Bibrous' or 'Bibraz' by the natives, a name by which the leek is also known. The plants are collected in great numbers by women in the hedgerows and fields.

Being anxious to ascertain the value of this vegetable I made some culinary trials. The whole plant during the winter takes the place of leeks in soups ; the odour is slight and pleasant ; the leaves are very tender and almost melt in cooking.

After this first trial I attempted the cultivation of the plant from seed at the Botanic Station, but experience quickly showed that in order to obtain plants as large and as presentable as good

leeks it was necessary to plant the wild bulbs at a sufficient depth (15–20 centimetres) at the end of the summer, for *Allium triquetrum* forms compact and extensive clumps.

The bulbs when isolated and planted deeply in good soil make a large plant during the winter, the buried portion of which is white, very delicate and most appetising. These plants when their green leaves have been removed make a very pleasant vegetable, without any trace of the smell of garlic or leek, and suitable with all sauces.

Such a complete transformation by cultivation of a useless weed invading gardens was quite unexpected. It is, however, sufficient to isolate the bulbs and to plant them deeply in order to obtain this great enlargement of the edible portion.

I do not hesitate to recommend *Allium triquetrum* so treated as a very interesting vegetable for gardens bordering on the Mediterranean.

Of the figures accompanying the note one represents a cultivated plant which has undergone neither selection nor mutation and another a spontaneously grown plant from the same soil, selected from among the best specimens.

The Root and Haustorium of Buttonia natalensis.—For many years Kew has been anxious to ascertain what might be the host plant of *Buttonia natalensis*, Macken. (*Scrophulariaceae*), which is said to be the handsomest climbing plant in Natal. Thanks to Dr. J. Medley Wood, Director of the Natal Herbarium, we have now received material of the roots of both host and parasite, preserved in formalin, which has allowed of an examination of the mode of attachment of the haustoria to be undertaken.

Buttonia is a rare plant confined to the coast district, and it is to Mr. W. J. Haygarth, who found some plants near Durban, that we are indebted for the material and for information as to the host plant.

The host plant appears to be almost certainly *Euphorbia grandidens* and the material sent by Dr. Medley Wood included several roots of the parasite with their haustoria attached to the roots of the *Euphorbia*.

Some observations on this material are described in the following note.

A colouring matter is present in the root, and is interesting on account of its mode of occurrence. It is yellow, orange, or brown according to the degree of accumulation, and it appears to belong to the xanthic series of pigments. It dissolves in alcohol, but not in water, and in concentrated sulphuric acid it turns a dark blue colour. The pigment occurs as a granular mass filling the cavities of a few cells belonging to the phloem, and is also found in the form of granules in some of the cells of the primary cortex. The peculiarity of its occurrence, however, is that it is chiefly located in special thickenings of the cell-walls of numerous cells in the primary cortex, and here it has the appearance of a yellow or brown stain, no granular character being observable.

On dissolving out the pigment with alcohol, the thickenings are seen to have a stratified structure (Fig. 1) resembling that of the cellulose basis of some cystoliths. They are not, however, composed of cellulose, as they do not give a blue colour with iodine and sulphuric acid, or with Schulze's solution. Several other microchemical reactions were tried, and the results appear to indicate that the thickening-masses consist of some substance related to mucilage, but of a rather resistant character, and containing a slight admixture of protein.

A periderm is formed rather early in the root, and arises in the third or fourth layer below the surface. Between the periderm and the endodermis there are usually from four to six layers of cells representing the inner portion of the primary cortex. This is the region in which the cystolith-like thickenings occur. They are present in many of the cells and are generally attached to the cell-wall just where it borders on a small intercellular space, and thus are often arranged in groups of three or four (Fig. 1).

The colouring matter in *Buttonia* may be compared with that found in *Craterostigma pumilum*, another member of the *Scrophulariaceae*. In *Craterostigma* the pigment is red, but is to be classed with the xanthic series of compounds, and also has a peculiar mode of occurrence in the root. Here it occurs in granular form, and is found in intercellular spaces in the cortex, lying on the surface of the cell-walls bounding these spaces.*

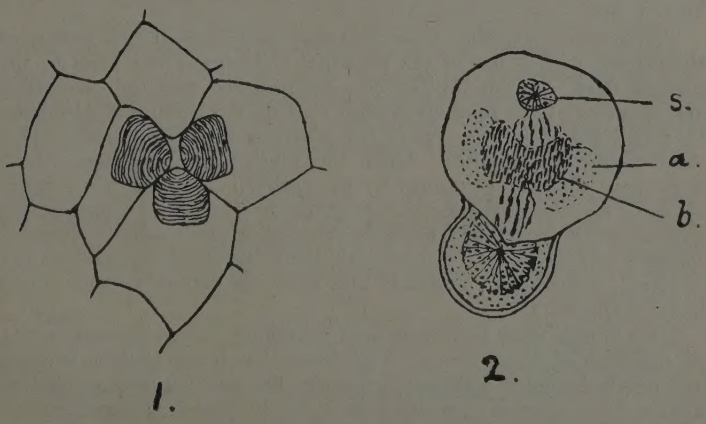


Fig. 1. *Buttonia*, thickenings in cortical cells (× 390).
Fig. 2. Section through haustorium of *Buttonia* and root of host (× 10).

The haustorium of *Buttonia* attacks the root of the host-plant in the usual way, and penetrates the vascular cylinder of the latter (Fig. 2), eventually reaching the centre. In some cases the root of

* Marshall Ward and Dale, Trans. Linn. Soc., 2 ser., vol. 5, p. 346.

the host is killed for a short distance, the cortex becoming locally withered and separated from the stele. In most of the cases examined the haustorium was still attached to living portions of the root on one or both sides of the dead part, so that parasitic nutrition could still be maintained.

The structure of the haustorium is shown diagrammatically in Fig. 2. The so-called nucleus of the haustorium has a central portion (*b.*) composed of numerous short tracheides mixed with parenchymatous cells. This is surrounded laterally by a zone of differentiated parenchymatous tissue (*a.*) apparently representing phloem. The greater part of this and of the central mass of short tracheides has been derived from a cambium lying between the two tissues. The central group of tracheides is connected with the stele of the parasite (*s.*) on one side, and with that of the host on the other by means of straggling tracheides, indicated by lines in the diagram. The type of structure is similar to that of the haustorium of *Exocarpus cupressiformis** and other root-parasites.

L. A. B.

List of Gold Coast Trees and Shrubs.†—The list is intended to assist Forest Officers in the bush. The sources of Mr. Chipp's information are his own collections and observations on the spot, and the rich collections of Gold Coast plants preserved in the Kew Herbarium.

The preface contains a short history of botanical exploration in the colony, with a list of the principal collectors from 1783 to the present date. About 330 species are included, and the systematic arrangement of the families is after that of Bentham and Hooker's Genera Plantarum, the genera being arranged alphabetically under their respective families. Only those plants are included which have been actually examined by the author. The full distribution of each species in the Colony is given so far as known, together with economic notes and notes on peculiarities of habit. Lists of English and of Native names with their botanical equivalents are included, and also an index to the botanical names quoted in the body of the work.

Mr. Chipp's work is an excellent beginning in a systematic study of the flora of the Colony. The book is well and clearly printed, and neatly bound in stiff canvas covers, the solution used in binding having been specially prepared in order to render it impervious to the ravages of insects.

Had a smaller page been adopted the book would have been more convenient for carrying in the pocket.

J. H.

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* Benson, Root Parasitism in *Exocarpus*. Ann. Bot., vol. 24, p. 670, Text-figure 2.

† A List of Trees, Shrubs and Climbers of the Gold Coast, Ashanti and the Northern Territories, by T. F. Chipp, B.Sc., F.L.S., Assistant Conservator of Forests, Gold Coast. London. Waterlow and Sons, Ltd., 1913. 8vo. pp. 59.